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The
Geographical Journal.

No. 6. DECEMBER, 1907. Vol. XXX.

ON NORTH POLAR PROBLEMS.*

By Dr. FRIDTJOF NANSEN.

Driftwood.—A careful study of the driftwood from Siberia and America, found on the various Arctic coasts, might give valuable information as to the drift of the ice across the unknown north. We have, however, to distinguish between two kinds of driftwood, viz. modern driftwood, which is found on the drifting ice, or floating in the sea, or lying on the shores near the present shore-line, and which has evidently been carried thither recently, and what we may call post-glacial or semifossil driftwood, which is found on land at levels generally above present shore-line, and often high above it. Great accumulations of the latter kind of driftwood are found on many places of the Siberian coast, where it has been called Noah wood. I have there seen thick layers of it in the lake-beds and river-beds. The Nares Expedition found great quantities of post-glacial driftwood on the northern coasts of Ellesmere Land; it has also been observed on Prince Patrick island, on Banks island, etc. The occurrence of this wood on northern coasts which are now closely ice-bound all the year round indicates a milder climate with a more open sea, during the period when this driftwood was deposited on the coasts, which at that time were more submerged than they are now.† For on an ice-bound coast much driftwood cannot possibly be carried ashore and remain there. The wood is carried along

* Continued from p. 487.

† In Scandinavia, and in this country, as well as in Spitsbergen and Franz Josef Land, there has been at least one milder period (the so-called Tapes period) than the present one during post-glacial times, when the land stood comparatively lower than now. It seems possible that the milder periods in the north, when the accumulations of driftwood were deposited, were simultaneous.

with the ice, generally more or less embedded in it, and where the ice does not melt away, or there is no open water of importance, the driftwood gets very little opportunity of being thrown on to the beach. It can only happen by very rare accidents. We must therefore expect to find extremely little driftwood on the ice-bound coasts at present.* As an example, it may be mentioned that only very little driftwood is found on the northern coasts of Franz Josef Land, although this group of islands are not very far distant from the great rivers of Siberia, and although a fairly continuous transport of driftwood is carried with the ice past the islands.

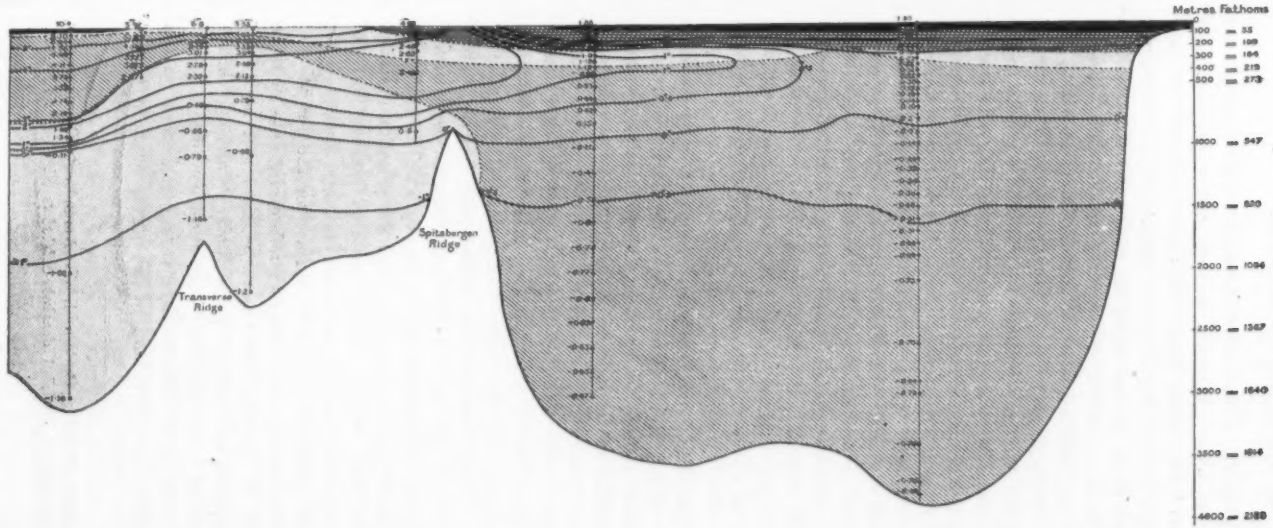
But the fact that modern driftwood, either Siberian or American, is found on the northern coasts of Greenland, Ellesmere Land, and the Parry archipelago, and even on an ice-floe a few miles off the northern coast of Ellesmere Land (as mentioned by Admiral Parr during the discussion after Markham's above-mentioned paper), proves with all desirable certainty that this ice is not stationary, but has been drifted across the North Polar sea, and that there is a continual ice-drift across the unknown region. But this fact hardly speaks in favour of much land in the Unknown North.

Diatomacea on the Ice.—I may in this connection also draw attention to the *diatoms* found on the surface of the polar ice-floes, which, when studied more carefully, might give important information as to the drift and origin of the ice met with in the Beaufort sea, and to the north of the American Arctic archipelago and Greenland. The diatoms found in mud I had collected on ice-floes in the Denmark strait, near Iceland, formed to me, before I started, one of the best evidences that there is a continual ice-drift across the North Polar sea by which a ship could be carried.

The Cold Bottom-Water of the North Polar Basin.—My chief evidence to prove a wide extension of the North Polar basin, was formerly † the existence of a cold bottom water in that sea. As this bottom water has a higher salinity (above 3·5 per cent.), and is also somewhat warmer than that of the Norwegian sea, having at the same time a higher density, the two basins must be separated by a submarine ridge (see Fig. 5), extending from Spitsbergen north-westwards towards Greenland, and it is not probable that the two different bottom waters can have the same source, or be formed in the same region. The bottom water of the North Polar basin must be formed inside that

* It is consequently erroneous when Mr. R. A. Harris believes that the probable existence of land to the north preventing the driftwood from being carried across from Siberia, should be proved by the fact that the amount of driftwood found along the northern coast of Greenland is small in comparison with that found on the northern coast of Spitsbergen, or the eastern coast of Greenland.

† See *Norwegian North Polar Expedition*, 1893–96. *Scientific Results*, vol. 3, No. 9, pp. 399 *et seq.*; vol. 4, No. 13, pp. 227, 228.



SALINITY

- Below 3·2 %
- 3·2 % 3·485 %
- 3·485 % 3·5 %
- Above 3·5 %

FIG. 5.—SECTION ACROSS NORTH POLAR BASIN AND NORWEGIAN SEA.

sea, and it is evidently the Atlantic water, carried north through the Norwegian sea by the warm Atlantic current, or the so-called Gulf Stream, and cooled down below zero Centigrade (between zero and −0°·9 C.) somewhere in the North Polar basin. As, however, the latter sea is covered by a surface layer of cold polar water with a low salinity and density, 150 or 200 metres (about 100 fathoms) thick, wherever it has been explored, it seemed improbable that the underlying warmer Atlantic water could anywhere come to the surface inside this region, and the only manner in which it could be cooled down, seemed therefore to be by contact with the overlying cold surface layer. But as such a cooling process would necessarily require a very long time to give the warm Atlantic water the observed lower temperature of the bottom water, and as everywhere along the *Fram's* track the cold bottom water was separated from the cold surface layer by a warmer water-layer, about 600 or 700 metres (320 to 380 fathoms) thick, with temperatures above zero Centigrade, I came to the conclusion that this cooling process of the bottom water must take place in some extensive, distant area of unknown sea, and that consequently the deep basin discovered by us must cover the greater part of the still Unknown North.

By later investigations I have, however, come to a different view as to the formation of the cold bottom water of the north polar basin. I have found that warm Atlantic water cannot possibly be cooled down to the lower temperature of the bottom water simply by contact with overlying colder water, even though the North Polar basin were ever so extensive. A cooling of the water of this kind, to form cold bottom waters, can only take place in the surface of the sea by radiation of heat from the surface during the winter and spring. In this manner is the bottom water of the Norwegian sea formed, and so is also that of the Barents sea formed, though on a much smaller scale. And such is certainly also the process of formation of the bottom water of the North Polar basin. In a recent paper * I have discussed this question in detail, and have pointed out that in the shallow parts of the sea north of Spitsbergen and Novaya Zemlya there are most probably, during winter and spring, favourable conditions in the sea-surface for the formation of the north polar bottom water, and it may therefore originate in these regions. But if this be correct, the known vertical and horizontal distribution of temperature and salinity in the North Polar basin cannot be said to prove anything with regard to a wide extension of this basin.

The Tidal Wave.—Mr. R. A. Harris lays very much stress on the evidences of an extensive unknown land in the north, which he thinks

* F. Nansen, "Northern Waters: Captain Roald Amundsen's Oceanographic Observations in the Arctic Seas in 1901," *Videnskabs-Selskabets Skrifter, Kristiania*, 1905, 1, No. 3.

is given by the marked difference in the range of the tide on Bennett island (about 2 feet) and on the coast of Alaska (about 0·4 foot). He cannot account for this difference unless an extensive land in the Unknown North prevents the tidal wave from crossing the North Polar basin straight from Spitsbergen to Alaska, and instead, compels it to make the circuit round by Bennett island. Mr. Harris does not, however, take up for discussion the difficult problem of the tidal phenomenon in the North Polar sea. On the whole, his conclusions are simply based on a very small number of observations of rather an accidental nature; and he has hardly quite realized how very complicated and difficult tidal problems of this kind may be. As an example, it may be mentioned that the range of the tide which I observed on the northern coast of Franz Josef Land was hardly as much as 2 feet, which the *Jeannette* people found on Bennett island, and still Franz Josef Land is nearer to the Atlantic, and is not protected by land to the north. As another example may be mentioned Northern Norway, where the tides are considerably higher on the coast of Eastern Finmarken and on the Murman coast than, for instance, Tromsö or on the Lofoten islands. If Mr. Harris's method of arguing were correct, this would naturally lead to the absurd conclusion that the latter coast must be protected by land outside, and that the Atlantic tidal wave reaches the Murman coast and Eastern Finmarken before it reaches the Lofoten islands. Mr. Harris has evidently not been aware that the facts mentioned by himself speak against his own method of reasoning. Pitlekaj, where the *Vega* wintered in 1878–79, near Bering straits, is not much further distant from Bennett island than Point Barrow, but nevertheless the mean range of the semi-diurnal tide is there only 0·2 foot, whilst it is double, 0·4 foot, at the latter place. The range of the tide and its periods are greatly influenced by various conditions, and not merely by the distance which the tidal wave has to travel. The trend of the coast, the depths of the sea outside them, are of importance, and very often there are several tidal waves, coming from different directions; the range of the tide may then differ much at short distances according as these waves coincide.

An intelligent study of the tidal phenomena along the Arctic coasts might tell us much about the depths and geography of the Unknown North; but then we shall have to take all sides of the question into consideration, and we shall want a good material of systematical tidal observations taken in different parts of the region.

The Meteorology of the Arctic Regions.—The meteorology of a region is greatly influenced by the distribution of land and water. Extensive land masses are apt to create a continental climate, whilst great expanses of open sea produce a maritime climate. * If the sea be covered by ice it has not this maritime effect to the same degree as if it were open, but it will nevertheless make the climate more maritime than if it

were replaced by land. A careful study of the meteorology of the known Arctic Regions might thus give some information as to the probable distribution of land and water in the Unknown North. The meteorological observations of the *Fram* Expedition, 1893–96, in the North Polar sea hardly indicate that there can be any very extensive land masses in the Unknown North, for, if so, the climate along the *Fram's* route might have been expected to be more continental.

Migratory Birds.—Some travellers—as, for instance, recently, Mr. Einar Mikkelsen—have attached much importance to migratory birds travelling northwards into the unknown, as evidences of land in that direction. One has, however, to be cautious in trusting evidences of this kind. It depends naturally much on what kind the migratory birds are, but the routes along which they travel are often very puzzling. For instance, the fact that a great number of birds pass Point Barrow in the spring on their way towards the north-east, need not prove anything with regard to unknown land in that direction, as the birds might be on their way to Banks island and the Parry islands, and it is just probable that the migratory birds of those regions come to a great extent by the route of Point Barrow. On the other hand, it should also be considered that when migratory birds are seen flying seawards or coming from the sea, they do not always go to or come from land. During the *Fram* Expedition eider ducks and even flocks of land birds (*Phalaropus*) were seen in the North Polar sea in very high latitudes and far north of any land.

Legends of the Eskimo about Unknown Lands.—The Eskimo of Alaska and the American Arctic archipelago, as well as the natives of North-Eastern Siberia, have legends about lands to the north of Alaska and Siberia to which they have travelled, or from which they have come to the American Arctic coasts. Several authors have considered these legends to be important evidences that such unknown lands actually exist. Folklore is, however, of very little value for geographical discussions of this kind. The tales of folklore may wander over great parts of the Earth from one tribe to another, and they very frequently get some local colour in order to localize them in each special region. Tales of great lands far out in the sea, which are often unusually fertile and happy, are especially common amongst natives living on coasts. I may, as an example, remind you of the old legends of Great Ireland in the sea west of Ireland, and also those of a fairyland west of northern Norway. Sometimes certain features of these legends themselves indicate that they cannot have originated in the region where we meet them. This is, for instance, the case with the legend told by the Eskimo of Point Barrow about a hilly country to the north inhabited by people like themselves, to which some of their tribe were carried on ice broken up in a southerly gale. If such a land exists in the north it is at any rate ice-bound, and it is not probable that people

could be carried thither on an ice-floe; it is probable that the tale has come from coasts where the sea was more open. On some coasts the people are carried away to the unknown lands in drifting ships or boats, or—according to Greenland legends—even in a shoe. The traditions of land having been seen far out to sea are often equally untrustworthy, and have very often in the history of exploration proved fallacious.

The North Polar Problems of the Future.

I shall try to give a summary of what, in my opinion, are the most important North Polar problems now waiting for their solution.

1. *The North Polar Basin.*—I have already mentioned above that the most important feature of the geography of the North Polar regions is perhaps the North Polar basin, and the greatest deed of geographical exploration still to be done in the north is, therefore, without comparison, an exploration of the extension, depths, and general physical conditions of this deep sea basin. A great deal of this work could be attained by a new expedition like that of the *Fram* in 1893–96, drifting across the still unknown sea to the north of the *Fram's* track.

2. *The Edges of the North Polar Basin.*—The extension and shape of the north polar basin will have to be settled by exploration of its edges. The extension and configuration of the continental shelf north of the American Arctic archipelago and Alaska, as well as eastern Siberia, are, therefore, features of the very highest importance to get examined, as it would actually mean tracing the determination of what I would call the submarine coasts of the deep North Polar basin. The solution of this problem could only be attained by numerous soundings, and it would be of great value to examine at the same time the temperature, salinity, and, if possible, the currents of the water-strata at various depths over the shelf and beyond it. This great work must chiefly be carried out by sledge expeditions, which, however, is no easy task, as it is difficult to carry the necessary sounding equipment and instruments on sledges; but it can be done. Sir Clements Markham has already pointed out the Beaufort sea, north of Alaska, as a region where it would be of special interest at present to know the extent of the continental shelf. It would be valuable to know whether it is traversed by deep submarine fjords, whether the Beaufort sea is deep, and if so whether its basin is a part of the deep North Polar basin across which the *Fram* drifted. Some trustworthy observations of the temperature and salinity of its deeper water-strata would settle the latter question. The expedition under Einar Mikkelsen, on board the small sailing vessel the *Duchess of Bedford*, has set out to explore this region, and has spent last winter on the north coast of Alaska, where it may do important work already this spring, by a sledge expedition over the ice to the north. Another expedition under the

Englishman Harrison has travelled down the Mackenzie river, as far as I understand, with a similar object. Having no vessel, this expedition may probably meet with greater difficulties before it can reach its base of operations. But let us hope that both expeditions will be successful, and be able to penetrate into unknown parts of that sea in order to make their observations; they cannot then fail to bring home results of great value.

Any soundings in connection with some, even though few, trustworthy observations of deep-sea temperatures and salinities west and north of the Parry islands would be of great value, and might tell us much about the possible extension of the continental shelf and of possible land in that region.

The determination of the extent of the continental shelf to the north of Axel Heiberg Land and Ellesmere Land would be a great achievement. I understand that this will be a part of Peary's programme on his next expedition, and he is certainly the man to carry it out. A satisfactory solution of this problem would be of more scientific value than even the attainment of the pole. On the whole it should be kept in view that the extent and shape of the polar continental shelf, which means the real continental mass, is the great feature of north polar geography, which is of much more importance, geographically or geomorphologically, than the possible occurrence of unknown islands on this shelf.

3. *The Unknown Sea off North-east Greenland.*—An investigation of the depths and the various water-layers (their temperatures and salinities) in the unknown sea between northern Greenland and Spitsbergen, in connection with an exploration of the still unknown north-eastern Greenland coast, would be of very great value, especially as the solution of important problems connected with the oceanic circulation in the North Polar basin and the Norwegian sea might thus be finally solved. It would be of great interest to learn the extent of the continental shelf in that region, and whether a sub-oceanic ridge actually extends between Greenland and Spitsbergen, as seems probable, and what its form and depths are, etc. This is, however, a difficult region to reach, as it is generally blocked by heavy ice. Mr. Mylius Erichsen, who is now on the north-eastern coast of Greenland, had the intention of making an attempt to penetrate seawards from Greenland into this region with sledges in order to make soundings. We hope that he may succeed, and that he will also manage to explore the last part of the circumference of Greenland which is still unknown.

4. *The Channels of the American Arctic Archipelago.*—I have already pointed out that the geomorphological features of the American Arctic archipelago, with its remarkably great fjords and sounds, are exceptionally interesting. A systematical research of the depths and water-layers of these channels, as well as of the Baffin bay, cannot fail to give very

important results, and would be comparatively easy to carry out. A thorough research of the geology and tectonic structure of those islands at the same time would be of great value. The geological investigations carried out during the English expeditions, and during the late Sverdrup expedition, have shown that the geology of these regions has many features of peculiar interest also from a geomorphological point of view. As a few examples I may mention the various glacial phenomena, the glacial and atmospheric erosion, as well as the marine denudation of these regions. What is the origin of the great channels and fjords, and what is their history of formation? These are important questions about which we at present know little or nothing.

5. *The Interior of the Greenland Inland Ice* is still, to a great extent, an unknown region, which it would be of much scientific interest to get explored. The inland ice has been crossed in the south by my own expedition, and further south by Garde, near its northern termination by Peary, but in its central and broadest part it is still perfectly unknown. A crossing in that region with an investigation of its heights, its surface configuration, its angles of slope, the conditions of the snow in its interior, its nunataks, its climatic conditions, etc., would be of the very greatest interest in various respects, and would give an important addition to our knowledge of the Arctic Regions and their physical conditions. We may in that way obtain most valuable information as to the conditions which probably prevailed in the interior of the European inland ice during the Great Ice Age. It is a part of Mylius Erichsen's programme to cross the Greenland inland ice near its broadest. May he be successful!

Methods of North Polar Exploration.

Before I finish, I wish to say a few words about the methods of the north polar exploration of the future.

Sledge Expeditions.—There can be no doubt that sledge expeditions will remain the chief method by which great parts of the still Unknown North will have to be explored. The drawback with sledge journeys across the north polar ice, as they have hitherto been carried out, is, however, that they tell us very little as to the region traversed, except where lands or islands are met with. Unless they be specially equipped, they give very little opportunity of soundings and oceanographical work. A sledge expedition across the unknown North Polar sea, which can only tell us that this sea is covered with drifting polar ice, tells us very little new indeed. It may give us some photographs showing the appearance of this ice, which we know fairly well beforehand, and it may perhaps make some observations showing the drift of the ice during certain weeks of the year. But the results of such an expedition are certainly in no reasonable proportion to the time, energy, and money spent. We are no wiser as to the depths of the sea traversed,

or to its currents, and the physical conditions of its water-layers—nay, even the ice itself over which it travelled could not be properly measured and examined. I can here speak from sad experiences of my own. I regret still that, during Johansen's and my sledge journey from our highest latitudes southward to Franz Josef Land, we had no opportunity of sounding the sea over which we travelled, and not even to determine the northward extension of the continental shelf north of Hvidtenland. As another example, I may mention that the discovery during the *Jeannette* Expedition of De Long islands (*i.e.* Bennett island, Henrietta island, and Jeannette island) was naturally a discovery of much less scientific interest than the discovery of the shallow sea, *i.e.* the continental shelf on which these islands are situated, extending so far northward from the Siberian coast. The islands could have been discovered by a sledge expedition of the ordinary type, but the much more important feature of the submarine shelf might have remained unknown. By a practical equipment the sledge expeditions of the future can be made more useful. Light and portable sounding-machines with piano-wire, and light handy instruments for oceanographic research, can be constructed, and can be carried on the sledges. It might thus be possible to make most valuable observations, at least down to certain depths—say 500 or 600 fathoms—without very great difficulty. The depth and bottom of the sea should be examined, and bottom samples collected, which can easily be carried. The water-temperature at various depths should be observed. Most valuable observations of the velocity and direction of the currents at various depths could also be made without great difficulty by handy and portable current-meters. The ice is especially well adapted for making observations of this kind, and it might thus be possible to make most interesting studies of the tidal currents and the circulation currents of the sea, as well as the more irregular wind-drift of the ice and surface water in various parts of the Arctic Region. It might be more difficult to determine the salinity of the water-strata, owing to the low temperature of the air, which might make it difficult to prevent the water-samples from freezing. By hydrometers of total immersion and a glass cylinder in a double water-bath slightly heated by a small lamp, it would, however, be possible to determine the specific gravity of the most important water-samples at once on the ice. The determinations could be very exact, as the temperature of the water-samples could easily be kept fairly constant near zero Centigrade by using melting snow for the outer water-bath.

By plankton-nets of a practical pattern samples of the plankton from various depths of the sea can also be collected, and can easily be carried in small bottles with alcohol.

It is thus seen that even oceanographic exploration of a high quality may be carried out during a sledge expedition, if it be properly equipped for it, and the necessary time and weight be sacrificed for it. But this

kind of work is decidedly difficult to combine with the beating of records and the attainment of high latitudes, although it is perhaps much more interesting.

Another kind of valuable observation which could be carried out during sledge expeditions, even much more easily than the above mentioned, would be exact measurements of the thickness of the flat ice-floes and the height of the hummocks and pressure-ridges. The thickness of the ice-floes can easily be measured in newly formed cracks in the ice, either by a long bamboo rod with a hook, or also by a line with a lead and a horizontal cross at its lower end which catches under the ice. One has to try to find flat ice-floes which have actually attained their thickness directly by freezing, and which are not built up of thinner floes shoved on top of each other. It would be of great interest to learn, by numerous measurements of this kind, what thickness the flat floes can attain in various parts of the North Polar sea. Similar observations can also be made simply by examining and measuring the greatest ice-blocks piled up during very heavy ice-pressures, when even the thickest floes may be broken and raised on end. This method has the advantage that it is easy to examine the various layers of the ice and see whether it is composed of several floes. Observations of the probable age of the ice should also be made. Only by tasting the ice it is, for instance, easy to decide whether the ice is only one winter old (in which case it tastes very salt) or more. Its general appearance, as well as its strata near its under side, might also give indications as to its age. If it is in summer, and all snow on top is melted away, its more or less brownish dirty colour, due to dust and diatoms accumulated by the meltings of one or several summers, might give important indications. Samples of the dust and diatoms should be collected. If it is in regions where the snow on top does not melt entirely during the summer, but accumulates from one year to another, the snow strata should be carefully examined, as they might give information as to the age of the ice. According to my experience, it is, however, hardly probable that anywhere in the North Polar sea, there falls so much snow on the flat floes that it does not melt away in the summer. By numerous and exact measurements of the hummocks and ice-ridges—especially the newly formed, but also the old ones—in connection with measurements of the thickness of the blocks of which they are built up, it might be possible to get some idea of the comparative strength of the ice-pressures in the various regions of the north polar sea. Our knowledge in this respect is very defective at present; the descriptions tell, as a rule, only that hummocks are very great or partly enormous almost everywhere, and that is little to go by. It would be well to carry a special handy levelling instrument for this purpose, by which each measurement could easily be done fairly exact in a few minutes.

Sledge expeditions over the north polar ice, carried out on the system indicated above, would certainly be able to give us much important information of lasting scientific value.

Balloons and Airships.—Some people believe in airships of some kind for future North Polar exploration. But with the very imperfect control we have of these capricious means of locomotion at present, they would afford us little opportunity of making observations of much value. I have above pointed out the drawback in this respect of sledge expeditions dashing across the North Polar ice, but a balloon expedition sailing through the air, even if it can be carried out successfully, would give still poorer results, as it would hardly be able to tell us much about the regions traversed, even if the weather happened to be clear and the surface of the North Polar sea were not hidden from sight by fogs. The observations which could be made would be chiefly of meteorological interest. Experiments of this kind may, however, be interesting from other points of view, although I cannot see that the North Polar sea is a favourable region for making them, and I cannot help thinking that it would be wiser, and even more advantageous, to make such experiments in inhabited regions with more favourable climatic conditions, where a failure of the airship would mean less risks, and where failing machinery could be more easily mended.

Submarines.—It has also been proposed to use submarines for north polar exploration, diving under the ice and coming up in the open water-channels and lanes. This method would give excellent opportunity of exploring the unknown sea, if it were practicable. I do not think the chief difficulty would be to find sufficient open water to come to the surface in; but the submarine would have to go to a depth of at least 30 or 40 fathoms below the surface in order to be certain not to run into the under-side of the great hummocks; and this fact alone is, I am afraid, sufficient to make schemes of this kind valueless, at least for the present.

Ice-breakers.—Admiral Makaroff was of the opinion that strong ice-breakers would afford the best opportunity of exploring the North Polar sea. But even his excellent and very costly vessel, the *Yermak*, was no great success in this respect, and was not able to make much headway through the really heavy north polar ice. Even if sufficiently big and strong ice-breakers could be constructed to break their way through that ice, they would become so expensive that they would hardly be inside the limits of practical possibility. And besides there would always be the difficulty for ships of this kind to carry the necessary supply of coal for a long voyage through the ice.

Drift with the Ice in a Ship.—A practicable, and in several respects very advantageous, method of exploring the still unknown North Polar sea would be a drift with the ice in a ship sufficiently strong to stand the ice-pressures, as was proved by the *Fram* expedition. I strongly

advocated this method years ago, and shall not, therefore, go into detail here. I then pointed out that if the vessel entered the ice north or north-east of Bering straits, say somewhere near 160° W. long., she would be carried across the unknown regions of the North Polar sea, far north of the *Fram's* track, and after a period of about five years she would be carried out on the other side, near the north-east coast of Greenland. An expedition of this kind would give most important results, as there would be the most excellent opportunity of exploring thoroughly the physical conditions of the region traversed. With our present experience we should be able to give such an expedition a most perfect equipment of useful instruments for investigations of the sea at all depths, as well as the atmosphere in different heights (by kites), etc., and a perfectly unique material of important observations could be thus collected.

By the arrangements of Admiral George W. Melville, of the United States navy, and Mr. Henry G. Bryant, President of the Geographical Society of Philadelphia, about thirty-five specially constructed drift-casks were placed on ice-floes or cast adrift north of Alaska and Bering straits in the summers of 1899, 1900, and 1901, the hope being that valuable data concerning the speed and direction of Arctic currents might thus be secured. Only two of these drift-casks have again been heard of. The one was cast adrift on August 21, 1901, in 72° 18′ N. lat. and 175° 10′ W. long., and was recovered a year later near the mouth of Kolyuchin bay, on the Siberian coast west of Bering strait. This cask had evidently got a bad start, and, like the *Fram* during the first months of her drift, it had probably been drifted south by northerly winds, perhaps already during the first autumn. The other drift cask which has been recovered is, however, much more interesting. It was placed on an ice-floe west-north-west of Point Barrow, Alaska, in 71° 53′ N. lat. and 164° 50′ W. long. on September 13, 1899; and it was found six years later, on June 7, 1905, on the northern coast of Iceland, in 66° 31′ N. lat. and 16° 28′ W. long., where it had been drifted ashore. There can be no doubt that this cask has actually been drifted across the unknown region to the north of the routes of the *Jeannette* and the *Fram;* it must have taken very nearly the course I have proposed above. As we cannot know how long the cask had been lying on the Icelandic shore before it was found, or how long it had been drifting in open water near the Iceland coast before it was finally thrown ashore at this place, it is impossible to say how long the drift of the cask across the North Polar sea from its starting-point has lasted, but we know it must be less than five years and nine months. The probability is that the drift from the sea north of Alaska to the sea east of northern Greenland has not lasted longer than five years; and in this period a drifting expedition across the Unknown North may probably be finished.

Before the paper, the PRESIDENT: I have now to introduce to you His Excellency, Dr. Nansen. It is a work of supererogation, but it affords an opportunity of saying how sincerely we always welcome amongst us our distinguished Honorary Corresponding Member, and especially when, as to-night, he is good enough to give us, from this platform, the benefit of his experience and his thought. It seems almost yesterday that Dr. Nansen received from the hands of our former President, Sir Clements Markham, that special Gold Medal which our Society awarded to Dr. Nansen for his Polar Expedition. That award was ten years ago. It was about six years earlier that Dr. Nansen first came amongst us to receive our Patron's Gold Medal for his scarcely less memorable explorations in Greenland, which he was the first to traverse in its entirety. During those sixteen years our Society has learned to look upon him as in some way belonging to itself, and that feeling was, if possible, strengthened when His Excellency came to the Court of St. James's as the accredited representative of that old kingdom of Norway, of which the reigning sovereigns are so closely related to our own King and Queen. The sympathy of Britons with Scandinavia runs warmly in our blood, in which the Norse element is not only considerable, but also extremely active, as I think is evidenced in our maritime history and in our conquests beyond the seas, which recall the gallant actions of the Norsemen of the Middle Ages. But the affections of our Society for Dr. Nansen do not rest only on the fact of his being a hardy Norseman; they are based mainly on his remarkable personality, which cannot fail to impress itself upon all who come in contact with him. Among his many virtues is that of thoroughness, and in hearing to-night his address on Polar Problems we shall have the satisfaction of feeling that we are listening to one whose experience and thought in that direction are absolutely unrivalled. I now call upon His Excellency to give us his address.

After the paper, Sir CLEMENTS MARKHAM: We have all listened with great pleasure to this most interesting address. We are always glad to welcome our friend Nansen here, not only owing to our admiration for him, but because many of us regard him with affection. He never comes here unless his addresses contain something that is important and often that is memorable. He came here to propound his plan before his great expedition, and he met with a quantity of adverse criticism which all turned out to be entirely wrong, while what Nansen said was perfectly accurate and correct. He had studied the subject with very great care, and I am glad to say that I was not one of those to criticize him adversely, because I entirely agreed with him on every point. I was not present at the meeting. The next time that he appeared amongst us was after he had returned from that great expedition. He deprecates my saying that he then drew the veil from the Arctic mystery; but at all events we may say that he gave us entirely new ideas about Arctic problems. I have only time now to allude to what we ought to do in the future. He has shown us that if this continental shelf right round the polar basin was explored, we must necessarily discover all the undiscovered Arctic land. We should, therefore, turn our attention to this point. I regret that he was unable to dwell a little longer on the question of the driftwood, which I look upon as a most important one. If Colonel Feilden is present—there is no man who knows so much about it—I should like to hear from him his opinion as to where that driftwood came from, whether it was from America or Siberia, because that is a matter which must be taken into our consideration. We must remember now that it will be no use, geographically speaking, it will be absolutely of no use, for Arctic sledge travellers to attempt exploration without the means of sounding at least 100 fathoms. I discussed that matter very carefully with Mr. Mikkelsen, and he was deeply impressed with its importance. He will not take it for granted that he has come to the edge of the continental shelf when he finds no bottom at 100 fathoms,

because it is possible he may have come upon one of those submarine fjords or valleys, and he will always take care to make certain that he is not mistaken on that point. We may now, I think, look upon it as an axiom in Arctic exploration in future, that we must devote ourselves to the examination of the continental shelf. Indeed, I look upon what Nansen has said as having given us the watch-word of the continental shelf. I thank him very much for the great interest he has given us this evening, and for the rich material for thought with which he has furnished us in his address.

Sir ARCHIBALD GEIKIE: Even if a geologist were disposed to criticize Dr. Nansen's opinions, his critical tendency would be apt to be silenced by his personal admiration of the man who displayed such marvellous endurance among the trials and dangers of the north, and who, since he returned safe and sound from these perils, has shown such a continued and enlightened interest in the subject of polar exploration and in inculcating the views to which his studies have led him. Listening, as I have done, with keen interest to what Dr. Nansen has said this evening, I gather that in the geomorphological part of his subject, he regards the most important problem to be the further investigation of the great sea-basin which he was himself the first to discover. In this opinion I am sure that most geologists will concur. He has referred a good deal to what he has termed the "continental shelf." I do not know that geologists generally would attach quite the same importance to that feature that he does. We are in the habit of regarding this continental shelf as a certain zone of instability where the relative levels of sea and land from time to time may vary, where the atmospheric agencies and the sea are at work, and where, in the course of ages, a certain more or less level platform has been cut out of the land. Whether the zone so eroded be a broad platform or a narrow one will depend partly on the angle of the slope of the edge of the continent, partly upon the length of time during which the continental margin has been exposed to denudation, and partly upon the nature and activity of the agents of destruction. In the case of the continental shelf of the polar basin, to which Dr. Nansen has referred, he spoke of the possibility of its formation having begun in Jurassic time. That may be true, though as yet we know little about the age of some of these great depressions on the surface of the Earth. But if the origin of this polar sea-basin started so recently as Jurassic time, the probability is that the terrestrial movements to which it was due have been continued in more recent periods. During the Tertiary ages some of the most voluminous volcanic eruptions which Europe has ever seen took place in our own region. It was then that the immense sheets of basaltic lava were poured forth, of which mere fragments are left in the Inner Hebrides, Antrim, the Færoe islands, and again in Iceland. The modern descendants and representatives of these volcanoes are not yet extinct; they are still vigorous in Iceland and Jan Mayen. Whether or not they have extended further north into the great polar basin remains to be discovered. It is quite possible, though the chances are perhaps against it, that if some future *Fram* shall direct its course right across the centre of that north polar basin, it may come across some volcanic vent still blazing away as Mounts Erebus and Terror are doing in the southern polar regions. Of the many important questions to which the lecturer has alluded this evening, that which to the geologist presents special interest is the further exploration of Dr. Nansen's great northern polar basin. We would like to have its margin traced, and to know by what kind of rocks it is encircled, whether or not it is one great basin, and whether from any part of its area a volcanic vent rises to the surface.

Colonel FEILDEN: Sir Clements Markham asks me to express an opinion from whence the driftwood found on the north shores of Grant Land and Greenland

is derived. It must come either from the Mackenzie and Coppermine rivers of America, or from the rivers of Siberia. The enormous beds of driftwood found by McClure on the west coast of Banks Land, and in lesser quantities on Prince Patrick island, are unquestionably the products of the American rivers. This wood from Banks Land was pronounced to be coniferous, and a cone to be identical with the present spruce pine of North America. During the passage of the *Investigator* along the west shore of Banks Land floating wood was seen. We may therefore assert with some confidence that the transportation of driftwood by the currents of Beaufort sea is still in progress, and must have continued for ages. Captain Amundsen kindly informed me that he met with no driftwood on the shores of King William island. This is explained, probably, by the Great Fish river emerging from extensive lakes north of the limit of tree-growth, and the currents drifting the Coppermine and Mackenzie wood to the westward into Beaufort sea. The problem that confronts us is, whether a current sweeps past Banks Land and Prince Patrick island, along the fringe of the yet unexplored North American archipelago, and deposits driftwood on the shores of Grant Land and North Greenland, or whether, diverted say at Prince Patrick island, it crosses the Beaufort sea and eventually joins into the *Fram* drift. The easterly drift met with by Peary north of Cape Columbia, and the drift tree embedded in the floe seen by Peary, are suggestive. On the other hand, can we doubt that the vast deposits of driftwood on the New Siberian islands and on Bennett island are products of the Siberian rivers, and following the track of the *Fram*, a large amount of driftwood must ever be passing across the polar area, some of which would be deposited on the north and east shores of Greenland, and presumably on Grant Land. Is it not possible that the ocean currents, in their vast gyrations within the polar area, may commingle the driftwood of the Asiatic and American rivers? We might gain some information from a careful examination of the drift-timber stranded on the north shores of Iceland. If it comes from the Siberian rivers, in all probability it is accompanied by the wooden perforated horseshoe-shaped net-floats used by the Russian and Samoyede fishermen of Siberia. I have found these along with great accumulations of driftwood on the east coast of Waigats, thrown up by the Kara sea. There is another interesting drift to be met with on the north shores of Grant Land and North Greenland. I refer to the ice-rafted erratics of granite, syenite, and archaic rocks, which are to be seen from present shore-line to high elevations in those regions. None of these rocks are known in North Greenland, nor in Grant Land, nor in Ellesmere Land north of the 79th parallel, nor in any of the islands of the North American archipelago yet discovered. It seems to me impossible that these erratics could have been translated by the ice-floes from Baffin bay, or up Smith sound to the shores of the polar ocean. The question is, From whence do they come?

The PRESIDENT: The hour is now so late that I must propose the usual vote of thanks to Dr. Nansen, and ask him if he has any remarks to make upon the discussion.

Dr. NANSEN: It is so very late that I am afraid I must not detain you very long. But there are a few things I should like to say a few words about. As to the possibility of unknown volcanoes in the north, I may mention one thing which might speak in favour of Sir Archibald Geikie's views. On the coasts of Norway there are found great quantities of two kinds of pumice-like stones, which have been examined by the Swedish geologist, Dr. Bäckström. The one kind is not real pumice-stone, but is iron slag thrown into the sea by some of the Scotch ironworks. The other kind is, however, real pumice-stone of a peculiar nature, it being composed of andesitic rocks. As no known volcanoes on this side of the North Pole

produce pumice-stones of this composition, it was assumed that they must have come from the volcanoes in Alaska; and as great quantities of them are found near old post-Glacial shore-lines high above present sea-level, it seemed probable that there had been a regular drift of these pumice-stones with the North Polar current across the North Polar sea from Alaska during previous post-Glacial times. There is, however, a possibility that they have not come from Alaska, but from some unknown volcanoes in the north producing andesitic lavas. With regard to the driftwood, I should like to have heard Colonel Feilden say still more about that subject. The great quantities found during the Nares Expedition on the coasts of Ellesmere Land interest me especially very much; some was found at heights of even above 150 feet.

Colonel FEILDEN: Found at 1800 feet.

Dr. NANSEN: That is very high indeed; and it may be that the wood found there has to be considered more as fossil wood. But, at any rate, comparatively modern driftwood is found high above present sea-level, and the wood cannot have been lifted to its present situation by ice-pressures or in any other way from the present shore-line. These pieces of old driftwood must have been drifted ashore during previous periods when the sea was nearly as much higher as the land where they are now found. And as there seems to be much driftwood of this kind, the probability is that the sea was then more open than it is now, because when the coasts are ice-bound, like the northern coast of Ellesmere Land is to-day, then we cannot expect much driftwood to be thrown ashore. I think the study of that driftwood is most important from a geological point of view; it may give valuable informations about the changes of sea-level or the shore-line in that region, and when there was a milder climate in the north, with more open polar seas. Perhaps those milder periods were simultaneous to the similar ones we have had in Europe in post-Glacial times, and evidences of which have been found in Norway, Sweden, Spitzbergen, and even Franz Josef Land. At that time our coasts were also somewhat more elevated than they are at present; but the elevation, at least at some places in Scandinavia, was then hardly more than 20 feet and less. It was, consequently, very little compared with the elevations mentioned in Ellesmere Land. I entirely agree with Colonel Feilden as to the origins of the driftwood, and I think that in those regions it chiefly came from Siberia, and it proves that not only at present, but also during previous geological times, there has been a continuous drift across the North Polar sea from the Siberian side towards the Greenland side. I wish, before I sit down, to use this opportunity of thanking you for your kindness, and the way in which you have received me and patiently listened to my lecture, which was very long, I am sorry to say, but I have the fault, I know, that when I begin a subject I have difficulty in giving it up again.

LORD CURZON ON FRONTIERS.*

By Colonel Sir T. H. HOLDICH, K.C.M.G., K.C.I.E., C.B., D.Sc.

No subject that could have been selected by the Chancellor of the University of Oxford for the Romanes lecture of 1907 could have been more appropriate than that of "Frontiers." As Lord Curzon remarked

* "The Romanes Lecture, 1907. Frontiers." By the Right Hon. Lord Curzon of Kedleston, D.C.L., LL.D., F.R.S., Chancellor of the University. Oxford: Clarendon Press. 1907.

at the commencement of the address, "It is a remarkable fact that although frontiers are the chief anxiety of nearly every foreign office in the civilized world, and are the subject of four out of every five political treaties or conventions that are now concluded, though as a branch of the science of government frontier policy is of the first practical importance, and has a more profound effect upon the peace or warfare of nations than any other factor, political or economic, there is yet no work or treatise in any language which, so far as I know, affects to treat of the subject as a whole." And it is certainly not less remarkable that a subject which is so intimately and inseparably connected with the study of physical geography should be treated officially as if it were an academic science based on certain fixed rules requiring no practical or even theoretical knowledge of the infinitely varied conditions out of which frontiers are evolved. Oh that Lord Curzon would write that book! Considering the range of information, historical, geographical, legal, and military, which that volume would embrace, it is marvellous how much of it he has succeeded in outlining in the "tabloid" which he offered for "passing consumption" in the Sheldonian theatre! His allusions to "frontiers in history" are sufficient to indicate the wide range of interest which surrounds this one branch of his subject. Commencing with the Farthest East, where there winds through plains and over mountains the Great Wall of China, he leads on to the classical mounds and ditches with which ancient Greece and Rome essayed to stay the approach of barbarian hordes, and passes finally to the Far West, where Canada was cut off by a ridiculous graticule-line, independent of all geographical considerations, from the rest of North America. Incidentally the story of our own frontiers, the Scottish borderland, is touched upon in eloquent terms—those marches which were watched by Marcher lords who "interwove a woof of chivalry and high romance into a warp of merciless rapine and savage deeds," and left behind them "a history which is written on the battered castles and peels of the Border, and enshrined in a literature of inimitable charm." All this is very alluring, but to do such a subject justice one would require the pen of Scott or Macaulay allied to an analytical faculty sufficient to deal with the practical issues of everyday frontier-making in the over-sea regions of the Empire. Only Lord Curzon can command such a combination.

It is, however, the practical side of the lecture which offers most opportunity for remark. Very clearly Lord Curzon draws the necessary line between the processes of delimitation and demarcation in settling a frontier on modern scientific principles, pointing out that the delimitation is the work of treaties and political authorities, and the demarcation falls to the lot of the geographer and engineer. There is, indeed, a great difference between the official or armchair settlement of a line on the basis of a map (or no map, as the case may be) and the process of defining that line by artificial means, or by the adoption of natural

features *in situ*. It is the latter process which leads to local discussion, delay, and dispute which may even terminate in a war, unless the framers of the delimitation are well advised as to geographical detail, or else are content to leave geographical detail entirely alone. Lord Curzon does not omit a reference to the danger of using loose geographical expressions—such as "the foot of the hills," for instance—in boundary treaties. It is the use of such expressions, as a matter of fact, which lands the demarcator in his most difficult situations. And he wisely refers to the inconvenience, expense, and frequent futility of the adoption of straight lines for frontiers, whether they be co-ordinate lines, such as parallels and meridians, or any other straight lines requiring artificial demarcation in waste places. With the infinite detail of demarcation methods, however, it is, of course, impossible even to deal in general terms within the compass of a Romanes lecture. It is a branch of the subject which much wants skilful literary illustration, and the enormous amount of experience gained of late years would furnish material for a very complete volume.

If anything, perhaps, the value of mountain ranges and great water-partings for the political division of nations might appear underestimated in Lord Curzon's lecture. It is true that great mountain systems do not always divide great river-basins. In fact, the rivers traverse the mountains more often than not; but so long as mountains last they will present the most impassable and recognizable form of barriers that the geographical world has to offer, and the fact of the rivers passing through them (so long as the possibility is recognized in treaty delimitation) hardly affects their value as frontiers. It was imperfect information as to the geographical conditions of the southern Andes which led to the dangerous dispute between Chili and Argentina (a dispute, by the way, which was settled by the award of King Edward VII., and is not alluded to by Lord Curzon, although he mentions the King of Sweden and the King of Italy as arbitrators), but for nearly 2000 miles that great mountain system now parts the two countries. The "Snowy" range of the Himalayas is none the less effective as the northern frontier of India because it is broken by the Indus and the Brahmaputra. Nor is it only the more important mountain systems of the world which afford good lines of political division; even minor water-partings are most useful, inasmuch as they so frequently require no artificial definition. Boundary pillars are ephemeral, and pass away, but the everlasting hills will, at any rate, outlast our own geographical era. Artificial definition is always slow and costly, and it is frequently dangerous likewise from the local dispute which arises during the protracted delay of demarcation. To pillar up a line through a desert, for example, is a futile waste of money, and Lord Curzon does not fail to indicate the value of the desert barrier without such demarcation. He calls attention to the

enormous extent of boundary settlement which has occupied British surveyors in late years. This may be estimated from the fact that in Africa alone, up to July in the present year, no less than 9250 miles of frontier had been laid down. There are now no "Hinterlands" in British Africa, and very few in India, so that it is difficult to say where this particular branch of frontier making is to maintain a future existence.

The lecturer refers to South America as a country with its boundaries mostly settled, but there is, as a matter of fact, still much to be done in that continent. Peru and Bolivia have not yet rounded off their common frontier, and there is even a vague dispute between Argentina and Paraguay as to respective spheres of influence. South America may yet again appeal to that great principle of arbitration, which is the dominant feature of modern frontier settlement.

The eloquence of the Chancellor's final appeal to his university to take its share in the stirring episodes of frontier life is worthy of one of England's best orators. No one who has breathed the breath of the frontier hills of India, and who has lived amidst the life of the old historic races who people the borderland, and who still retain much of the chivalry and the savagery of the Scottish marches of three hundred years ago, can fail to respond to the enthusiasm of India's late viceroy, when he wakes up the echoes of past achievements, and speaks of that unresting frontier, where the touch of his own hand was so often and so clearly felt, and which must have been to him the most alluring of his Indian studies, the most thorny of the many great problems which he lived to solve.

CAPTAIN PERCIVAL'S SURVEYS IN THE BAHR-EL-GHAZAL PROVINCE.*

We issue with the present number a map of the western part of the Bahr-el-Ghazal province, being a reduction from the original route surveys executed in that region during 1906 and 1907 by Captain C. Percival, of the Rifle Brigade. Captain Percival has been one of the most active of the British officers whose surveys have for the first time supplied a basis for the detailed mapping of the province, while at the same time helping to throw light on its hydrographical system. The main outlines of this had been known to geographers through the journeys of Lupton, Junker, and others, but many points of detail remained obscure, especially in regard to the lower courses of the streams draining the north-west part of the province, which the earlier journeys of Captain Percival (in association with Lieut. Bayldon, R.N.) did much to elucidate. This officer was unable, during his short stay in this country previous to returning to his post, to prepare an account of

* Map, p. 692.

his journeys, but he has placed his route-books at our disposal, and these enable us to put together some notes on the country traversed, although the bulk of the material consists of minute details unsuitable for reproduction in full. Among other points the journals give careful information on the size and rate of flow of the rivers, the height of their banks, the extent of inundation in the rains, the position of fords, the spots at which Government ferry-boats are maintained, and so forth. The altitudes, as determined by aneroid, are recorded throughout, and though the absolute values are of course not to be depended on, they give a useful idea of the variations of the surface. An estimate is also given of the altitude of the hills seen on the route, which in general appears to vary from 3000 to 4000 feet, though occasionally approaching 5000. Detailed information is likewise given as to the size of the villages, the names and comparative influence of the native sultans and sheikhs, the distribution of the tribes, the positions of the Government posts, and so forth, while the occurrence of the tsetse fly is noted wherever observed.

The first journey led from Deim Zubeir, the temporary headquarters of the western district, *viâ* Ragaa, Gebel Miggi, and Kafiakangi, to Hofrat en Nahas, the site of the old copper workings on the southern borders of Darfur. The start was made on May 21, 1906, and, the rains having commenced, some of the rivers were full and unfordable, though most had not reached a high level. Many, even of the smaller khors, contain water all the year. In the southern section, the greater number of the villages were inhabited by various sections of the Koreish (Kreish or Krej). Ragaa, the residence of Sultan Musa Hamed, is the largest place in the district, consisting of 400 to 500 houses, the people here being Ferogeh from Darfur. Between the Ragaa and Boro rivers the path reached a summit level of 2900 feet; a sharp drop then commencing towards the Boro.

The village of Sultan Miriki, on the right bank of the latter, is one of the best in the district, the people (Koreish Aja) being happy and well favoured. That of Sultan Said Buldas, one and a half days from the source of the Boro, is described as an excellent site for a station, as is also the village of Sheikh Seleman, on the right bank of the Boro. At about 36 miles from Sultan Said Buldas the path makes a steep descent of 600 feet in three-quarters of a mile, being here impracticable for loaded animals. From Sheikh Hamdan's—a healthy site free from tsetse—a fine view to the north and west was gained. Gebel Miggi lies about 3 miles to the east of this. Kafiakangi, about 32 miles beyond, is a Government police post, for a time the residence of Sultan Ibrahim Murad. A little to the south is the trading centre of Guku, visited by merchants from the Congo, Darfur, Kordofan, etc., the principal articles of commerce being ivory, rhinoceros-horn, and calico. The people are Furtit and Koreish. At Kafiakangi sandy ridges alternate with swampy,

black ground, water being found all the year a few feet below the surface, as well as in holes in the bed of the Vungo. At 9 miles beyond, the country changes its aspect, the forest ceasing, and giving place to an open grass plain, on the far side of which runs the river Obo (Adda of the Arabs).* When this is full, all the plain is covered to a depth of 2 feet. It is dry in summer, with the exception of pools containing fish, crocodiles, and hippo. On the adjacent flats game was abundant, and buffalo and rhinoceros were seen in the neighbourhood. The present residence of Sultan Murad is on the Umbelasha, which also floods most of the country when full, though Captain Percival seems to regard the Obo or Adda (which, he was told, rises a long way to the left of his route) as the main headstream of the Kir, or Bahr-el-Arab. At the time, the Umbelasha was very muddy and of the size of the Avon at Tewkesbury. Hofrat en Nahas lies some 4 miles further up-stream.

The copper-mines of Hofrat en Nahas (visited by Purdy in 1876) have not been worked for over twenty-five years. There are two large holes called Om (mother), the larger 15 feet deep, with smaller pits scattered about. The reef extended over a space of 600 by 300 yards and no further. There is a depth of about 15 feet of earth and rock (dark coloured where exposed) with no ore, and below this about 10 feet of copper-bearing reef, followed again by unproductive gravel or rock. Branch galleries, now filled up, afforded access to the ore, which was smelted over charcoal fires and made into round pieces about a foot across and from 1 to 2 inches thick. The reef was found accidentally by men who were searching for iron ore, and was worked by the Furtit people for the father and grandfather of the present sultan, who himself retired before the Dervishes to Kafiakangi. The copper is said to have fetched a high price in the Fur country and at El Fasher.

Returning to Kafiakangi, Captain Percival went east and south-east to Kabaluzu and Kossinga. The former is a great trade centre, being a meeting-point of roads from the Congo, Darfur, and various parts of the western Bahr-el-Ghazal district. It is the residence of the influential Sheikh Gadud (a subordinate of Sultan Musa Hamed), who brought the name with him from his former residence. One day north there are Mandala villages and iron-workings, and the Adda or Bahr-el-Arab is from one and a half to two days off. The people, who are very mixed (Ferogeh and other tribes), get water from the bed of the khor; but it is bad, and an epidemic broke out in 1906. A police post has been established during the present year. Between this and Telgona, the boundary between the domains of Sultan Musa Hamed and Sultan Nasr Andel is crossed. The people are Ferogeh, Mandala, and at Telgona mostly Ngungueh. The Boro, where crossed *en route* to Kossinga, was 80 yards wide, and full

* In a note on his map, Captain Percival expresses a doubt whether the Adda is not a distinct river from the Obo.

to its banks, but fordable. Kossinga, the residence of Sultan Nasr Andel, contains 300 to 350 huts. The sultan is the most civilized and enlightened man in the western district, though Kossinga cannot compare with Ragaa in size. There is a small daily market, and the place does some trade, being visited by Gallaba (Sudanese merchants). The people are Ngunguleh. Captain Percival went south from Kossinga to Deim Zubeir, where his aneroid on arrival read 2620 feet as against 2590 given by former observations.

Early in 1907, Captain Percival surveyed a longer route from Deim Zubeir by way of Gebel Zakka to Ragaa, to which the headquarters of the western district were transferred at the beginning of the year. His latest routes led from Ragaa to Kossinga and thence back to Deim Zubeir; and from the latter north-east to Chakchak, a Government post near the residence of the Dinka sultan of that name.

A few general notes on the nature of the country may be reproduced in conclusion. All the western district is forest, sometimes in the form of large trees. Much rubber occurs on the Congo side. South of a line through Kafiakangi, Kabaluzu, and Telgona the country is undulating, in large folds, the soil being red and sandy, so that it dries quickly. Further north the surface is flatter, with black mud and swamps. Towards the western frontier there are many hills, but these are scarce elsewhere. In the rains the country is choked with spear-grass eight feet high. Nearly all the rivers flow through grass plains, liable to inundation. The tsetse fly occurs almost all over the district, often very badly. The western district is the only part of the Bahr-el-Ghazal which contains Arabic-speaking peoples of Arab extraction. They do not, however, dwell south of the line through Telgona, Kossinga, Ragaa, and Kafiakangi-Guku, and all seem to have come south from Darfur within the last 30 years. The Arab line would appear to continue into French territory west and north of Kafiakangi. The Koreish and Banda are low-typed, unenlightened people, the latter having the finer physique. The Mandala elephant-hunters are a mixture of every type, being probably composed partly of revolted Arab slaves.

SURVEYS ON THE MOZAMBIQUE COAST.*

A USEFUL piece of work has been done by Mr. Carlos Usseglio, a land surveyor in the service of the Companhia de Moçambique, in the survey of the strip of coast between Beira and the delta of the Zambezi. Strange to say, this portion of the coast, though so close to one of the main gateways into the interior of South-East Africa, had never before,

* Map, p. 692.

apparently, been subjected to any sort of accurate survey, but has been shown, even on the latest Admiralty charts, with complete vagueness, any rough indications of its contours and nomenclature inserted therein now proving very different from the reality. Mr. Usseglio—a short account of whose operations, together with a blue-print copy of his original map, has been courteously placed at our disposal by the Mozambique Company—is said to be an expert surveyor, and as he covered the whole strip in question with a network of triangulation, and connected his work with fixed points at the two ends, his map, a reproduction of which we print in the present number, may be taken as giving a sufficiently accurate idea of the main features of the coast.

It will be seen from the routes shown in the map that Mr. Usseglio did not confine his attention to the coast-line itself, but made frequent *détours* inland, and was able to lay down the courses of the various small streams that drain this area. No great interval, in fact, separates his work from that of Mr. R. L. Reid, whose map was published in the *Journal* for January, 1905. The Nyamonga range, which forms the water-parting between the basin of the Pungwe and the coast streams above alluded to, was not, however, crossed by either traveller, and Mr. Usseglio's map marks the country in this direction as merely undulating.

Considerable difficulties seem to have been encountered in the execution of the task, owing especially to the scarcity of fresh water in the vicinity of the coast, the rivers becoming brackish through the influence of the tide, so that it was sometimes necessary to bring the needed supply from a distance. The crossing of the rivers also presented difficulties, and, besides this, Mr. Usseglio's native followers gave some trouble, so that it says much for his energy and determination that he was able to complete the survey in the short space of two months. This was only accomplished by frequently working without a rest from 5 a.m. to 5 p.m., and it would have been impossible at any but the coolest time of the year, when the natives drink little, thus lessening the difficulties of the water-supply. Another fact which favoured the rapidity of the work was the frequent occurrence along the coast of casuarina trees, which, being visible for long distances, could be utilized as points in the triangulation.

In making his way northwards from Beira, Mr. Usseglio was able to ford some of the rivers at low water, though boats were sometimes available. Thus the Savane was crossed in fishing-boats belonging to a company established there. This river forms a large lagoon parallel to the coast, and at certain points it is separated from the sea, at high water, merely by a line of dunes. Casuarinas begin to appear between the Savane and the Senga, and are scattered over the whole coast-line northwards as far as the Nyamisembe. Their seeds would seem to be transported hither by the tide. Near the Senga the dunes (which seem

to characterize all this coast) were very high, and presented the appearance of a ruined castle. Fresh water was found at their foot on the landward side. At Teu Teu, some distance inland, two white men were met—the company's administrator and a trader named Silva. On leaving the coast, herds of elephants were constantly seen, and hippopotami in the rivers. A native village was found on the estuary of the Nyamisembe, and the chief supplied boats for its passage. A wide "tando," or flat, extends from the Nyamisembe to the Mupa, separated from the sea only by a line of dunes and palm trees. Game abounds on it, and many lions and leopards were also seen. The crossing of the Luana, near which the Luabo company has two establishments, was somewhat perilous owing to the strength of the current.

The return was effected by the same route as far as Teu Teu, the path traversing a generally flat and sandy country covered in part by forest, which at one spot was particularly rich in rubber plants. From Teu Teu (where a market is held), the journey was continued by an inland route to Loforte, over very similar country to that traversed by the railway during the first 28 miles from Beira. The road from Loporte to Beira followed by Mr. Usseglio was found to have fallen into complete disuse.

TRAVELS IN GERMAN, BRITISH, AND DUTCH NEW GUINEA.

By Dr. RUDOLF PÖCH.

My two years' journey in German, British, and Dutch New Guinea in the years 1904–06 began with a four months' stay among the Monumbo (Potsdam harbour), on the north coast of German New Guinea. In the company of the missionaries there, I wandered into the Hinterland to the tribe of the Alepapun, as far as the village of Arimesi. The land is hilly, of coral rock, with steep slopes; only in its watercourses do you find bush, everywhere else is grassland. My next visit was first to the Iku mountains, a chain about 1200 feet high to the west of the Monumbo mountains, and then to the opposite island of Manam, with the 3000-feet-high volcanic mountain.

The main object of my investigations was the tribe of the Monumbo. I made, however, acquaintance also with all the western peoples to as far as the mouth of the Empress Augusta river, where I visited the Vatám, as also the Manam and the inland dwellers, Alepapun and Zepa.

The most important events during my stay were great dancing festivities with masks and songs among the Monumbo; the "Udsuangong" and "Zangal" dances before the beginning of the rainy season; next an outbreak of the volcano on Manam on October 24, 1904, which ejected its lava into the sea.

The results of my labours among the Monumbo may be summarized as follows:—

1. The Monumbo are a tribe of tall coast Papuas, with very long upper extremities, meso- to brachy-cephalic, long-faced, and showing the typically curved Papuan nose. An allied type dwells along the whole coast to the Augusta river, but they are meso- to dolicho-cephalic.

2. The Monumbo are a tribe numbering some five hundred, who, as a rule, marry among themselves, yet I failed to establish any inbreeding.

3. In their masks and dances they imitate animals, but have no further trace of totemism. The food prohibitions in force are not totemic.

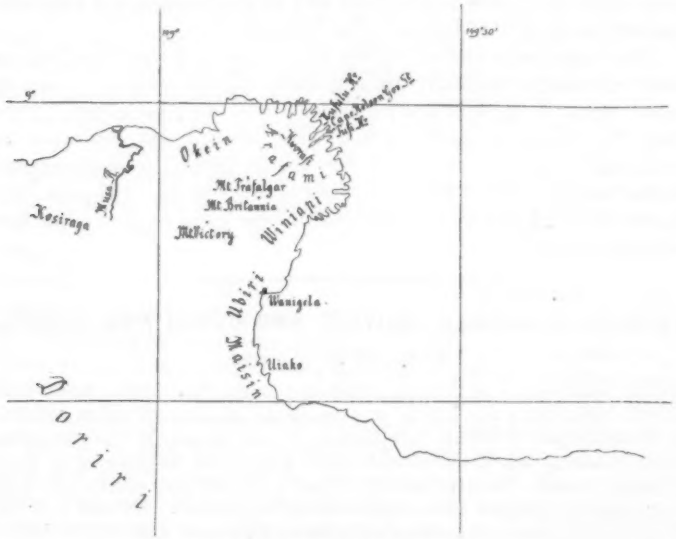
4. According to Prof. W. Schmidt's elaboration of the notes of missionary F. Vormann, their language is purely Papuan.

5. Only a few old men know the traditions of the people and are able to explain the ornaments.

6. For various industrial products there are centres, whence they are traded into farther regions.

7. The traditions for dances and songs come from the west.

8. The text of the songs is unintelligible to the people themselves, and is probably derived from an unknown, possibly an extinct, language.

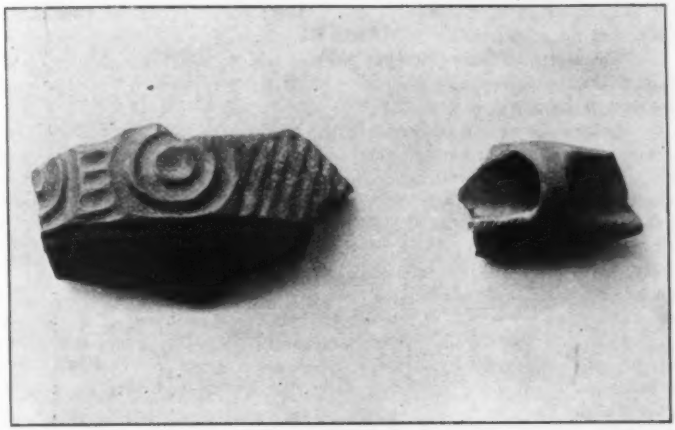


TRIBAL MAP OF CAPE NELSON.

My travels further comprised a two months' stay among the Kai on the Sattelberg at a mission station; a five days' wandering with Kai people into the Hinterland of Finch haven; a twofold crossing of the upper course of the Bubui, there called Mape, and of two hitherto unknown western affluents, Hu and Hopi. The march proceeded through very rugged mountain land covered with primæval forest, the mountain ridges we climbed being over 3000 feet above sea-level. On the slopes of the river-banks the land is thickly populated, but further to the interior the population is very scanty. The rocks are coral; overlying it is chalk, besides sandstone; in Mape there are quartz boulders.

The Kai are a mountain tribe of strong, squarely built people, meso- to brachycephalic, with faces not long, but angular; their average bodily stature I found to be 5 feet among the men. What is remarkable is a pretty considerable percentage of short people, measuring among the men 4 feet 4 inches. Have we here a species of a dwarf race? The language is purely Papuan; the vocabulary collected by Keysser has partly been elaborated by Schmidt.

The land of the Kai is divided into districts. Within the same district there wander village communities, who every year change their place of plantation and frequently at the same time their place of settlement.



ANCIENT POTTERY FOUND IN EXCAVATIONS AT WANIGELA, COLLINGWOOD BAY.

UIAKO, PAPUAN VILLAGE, MAISSIN TRIBE, COLLINGWOOD BAY.

The Kai possess a rich store of songs, whose meaning is still understood by them. The missionary Keysser is engaged in collecting and translating the poems, proverbs, and sagas.

Among the Poum, dwelling in the mountains inland from the Kai, fire is obtained by rubbing rotang on a cleft piece of the branch of a tree, bast serving them as tinder. I have followed up the distribution of this rarely recorded method, and have found a very recent record by C. A. W. Monckton in the mountains of New Guinea, in addition to two older accounts: one from the Negritos on the Philippines, the other from the Semangs in Malacca.

The investigations among the Kai suggest that further investigations should be undertaken in order to determine the relation of the undersized inland tribes of New Guinea to the Negritos.

In consequence of the massacres of the missionaries in St. Paul (New Pommerania), four Baining people were shot, and a greater number have been captured. This anthropological material, handed over to me for investigation, afforded my acquaintance with an apparently very primitive race, to judge by skull and skeleton. The skulls are strikingly meso- to brachy- and even hyperbrachy-cephalic, and the nose is broad.

My next field of work was the middle part of New Mecklenburg. The island is here so narrow that it may be crossed in a few hours, or at most half a day. The crest of the chain of mountains is nearer the south-west coast, and about 1300 feet high. There are a few rivers running a north-easterly course, and ending, after a short run, in a marshy estuary. In the upper course of one is a waterfall 150 to 180 feet high. The land is copiously watered. It is striking to find immediately on the seashore many fresh-water springs. The coast is of coral formation, and in the state of elevation. On the north-east coast, to the south of the village of Belik, I observed a second raised beach.

The inhabitants of Laur present a Melanesian type, and speak a language having affinity to that of the Gazelle peninsula. They have a totemistic system of two classes and matriarchate. There is a favoured class, protected by its stronger totem animal.

From German New Guinea I proceeded to Australia, and in Clarence district met the aboriginals of New South Wales. With their smooth hair, their strongly projecting orbital arches, the often deeply sunken nasal notch, and their broad, flattened noses, they presented a type in marked contrast to that of the Papuans.

In British New Guinea, now called "Papua," I stayed two months and a half on the north coast at the Government station of Cape Nelson, and a month on the south coast at Port Moresby. The region of Cape Nelson is volcanic. The three cones, Mount Victory, Trafalgar, and Britannia, are ranged close together. They have ejected immense lava-currents into the sea, which now lie spread out like the fingers of a hand, and between the fingers are deeply cut bays with steep banks. With the resident magistrate, G. O. Manning, I visited Collingwood and Goodenough bays. In Wanigela I prosecuted excavations which had been started by C. A. W. Monckton. Like him I found a carved shell, and pottery of a higher perfection than that now extant in this region. The beautiful ornaments are foreign. There is no tradition as to the people who produced this pottery. In the heap of *débris* I found a dolichocephalic skull. It is difficult to give any satisfactory account of this discovery. The account that most readily suggests itself would be to assume that a tribe migrated hither from the sea, and that this people were either driven back over sea or annihilated by the mountain tribes.

In Goodenough bay two different types of house-building are in close juxtaposition: houses on piles, built by the Papuan inland tribes; and houses resting immediately on the ground, built by the immigrant Melanesians of the D'Entrecasteaux islands.

On Mosquito island in the same bay there are many particularly large hills of

HILL OF THE MOUND-BIRDS (MEGAPODIUS), MOSQUITO ISLAND, GOODENOUGH BAY.

GRASSLAND NEAR BOIANA, GOODENOUGH BAY.

the mound-birds (*Megapodius*), which have been piled out of coral sand to over a man's height by these fowls as hatching-ground for their eggs.

On the south shore of Goodenough bay, in the neighbourhood of Boiana and further west, there stretches grassland, a rare sight in these rainy parts of New Guinea. As far as my observation goes, it is only in those parts in which there is an altogether bad coral soil porous to the passage of water that, as a matter of fact, forest has never grown there. No doubt primitive forest is sometimes extirpated by the Papuans themselves hewing it down and converting it into plantations, and afterwards burning down the grass and the germs of aftergrowth. Otherwise, however, primitive forest, as a rule, covers all the rainy part of New Guinea; grassland is the rare exception.

The investigation of the Korafi near Cape Nelson led to the following results:—

1. They must be taken as a mixed Papuan and Melanesian race.
2. Their language is probably not pure Papuan.
3. They are meso- to dolicho-cephalic.
4. They have a totemic system fallen into decay.

Tapa is made with considerable skill, and painted freely with vegetable colours in very tasteful patterns. There are beautiful dances for which head ornaments (not masks) are worn.

In celebration of the king's birthday, the resident magistrate, G. O. Manning, invited the natives of the North-Eastern Division to dances at the Government station at Cape Nelson. Some 700 men came, among them many who had never before been in Cape Nelson. I admired the great influence which the Government there, in scarce five years, had acquired over a territory as large as my native land of Lower Austria, and inhabited by Papuans who, from immemorial time, had lived in tribal fights and man-hunting.

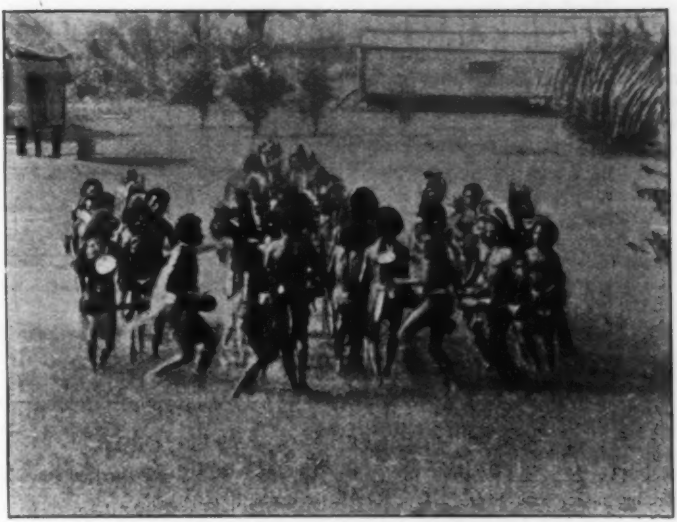
I succeeded here in getting a series of cinematographic photographs. The dance figures are beautiful and well arranged, and the people are still in their original costume.

As personal guest of the governor of British New Guinea (Papua), His Excellency Captain F. R. Barton, I was brought from Cape Nelson round East Cape to Port Moresby, where I was witness of the arrival of the great Lakatoi of the Motu people, the composite sailing-boats on which they yearly bring in sago from the Gulf of Papua. The Koita people and their customs are the subject of investigation by Prof. A. Haddon and Dr. Seligmann; I will only mention that here, too, I obtained rich booty for the cinematographs and phonographs of the Imperial Academy of Sciences in Vienna. Lastly, on the Government steamer *Merrie England*, I was conveyed to Thursday island, whence the Dutch gunboat *Valk* carried me over to Merauke.

The territory around Merauke, in Dutch South New Guinea, is a completely flat alluvial land, where no trace of an elevation is visible. From the sea you perceive a green strip of bush reaching almost to the water; in front of it the bright sand and the white surf on the shallow beach. There is nothing to interrupt these two thin parallel strips. Between Merauke and Fredrik-Hendrik island there discharge several large rivers. Rather large sea-ships can enter the Merauke river.

I next visited the Koembe and the Bian rivers. The latter I ascended with the Government official, and came into a hitherto unknown territory. The river turned sharply to the east, and we approached the Koembe. The natives say that in their upper course these rivers are confluent, a statement having some probability in its favour. The soil is sandy, but clayey in the neighbourhood of the river-mouths. Nowhere in this region did I notice any stone.

The natives are notorious head-hunters; they are called Tugeri, or Kaya-Kaya



NATIVE DANCE AT CAPE NELSON (PART OF A CINEMATOGRAPHIC PHOTO).

YOUNG MEN AND BOYS OF THE TUGERI TRIBE (KAJA-KAJA), DUTCH NEW GUINEA.

Formerly they extended their men-hunts eastwards on the other side of the Bensbach river. The British entered a protest with the Dutch Government, and, to keep the natives in check, the Dutch Government founded the Government station of Merauke. At first this station was in ill favour in consequence of beri-beri, which the Malays and Chinese had brought over with them, but now, in spite of its swamps and an enormous plague of gnats in the rainy season, Merauke is a healthy place, and, what is more remarkable, it is quite free of malaria.

My investigations respecting the natives yielded the following:—

1. The Tugeri (Kaya-Kaya) are a very tall type of coast Papuans, mostly dolichocephalic.

2. Poultry, salt, and pottery are unknown to them.

3. Their luxuries are tobacco ("tamuku," of Malay origin), betel, and vati—a kind of kava.

4. They go adorned mostly with trophies of the chase. Only the women have a covering round the loins.

5. They do not live in families, but the men, including those that are married, sleep in men-houses at the ends of the village.

6. The houses stand on the ground.

7. The Tugeri have a complicated totemic system, comprised of plants and animals, with head groups and subdivisions.

8. The totem is hereditarily transmitted through *the father*.

9. They have mask-dances, initiation ceremonies, with a ceremony of regeneration, but no circumcision.

10. They have bull-roarers.

RUWENZORI AND ITS LIFE ZONES.*

By R. B. WOOSNAM, of the British Museum Expedition to Mount Ruwenzori.

Itinerary of the Ruwenzori Expedition.

The expedition left England early in October, 1905, arriving at Mombasa in November. The journey from Mombasa to Entebbe on the west coast of Lake Victoria now occupies three days, whereas before the construction of the Uganda railway it was a long and difficult march of three months. After a short delay at Entebbe to arrange the caravan, the expedition was able to set out for the march of 180 miles to the mountain range of Ruwenzori, on the western border of Uganda, the object of the expedition being to make collections of natural history specimens, and especially of birds and mammals from the little-known Mountains of the Moon. Interesting objects on Lake Victoria are the great war canoes, holding as many as forty paddlers, which are made of long thin planks hewn from the centre of long tree-trunks.

As Toro, the western province of Uganda, was approached, a sharp look-out was kept for the first glimpse of the Mountains of the Moon, but it was not until two days before reaching Fort Portal that we were rewarded with a view. At dawn, from a camp about 30 miles from the foot of the mountains, we obtained for the first and only time a view of the entire range absolutely clear of cloud. A great mass of dark blue mountains lay spread out before us in the form of a long ridge,

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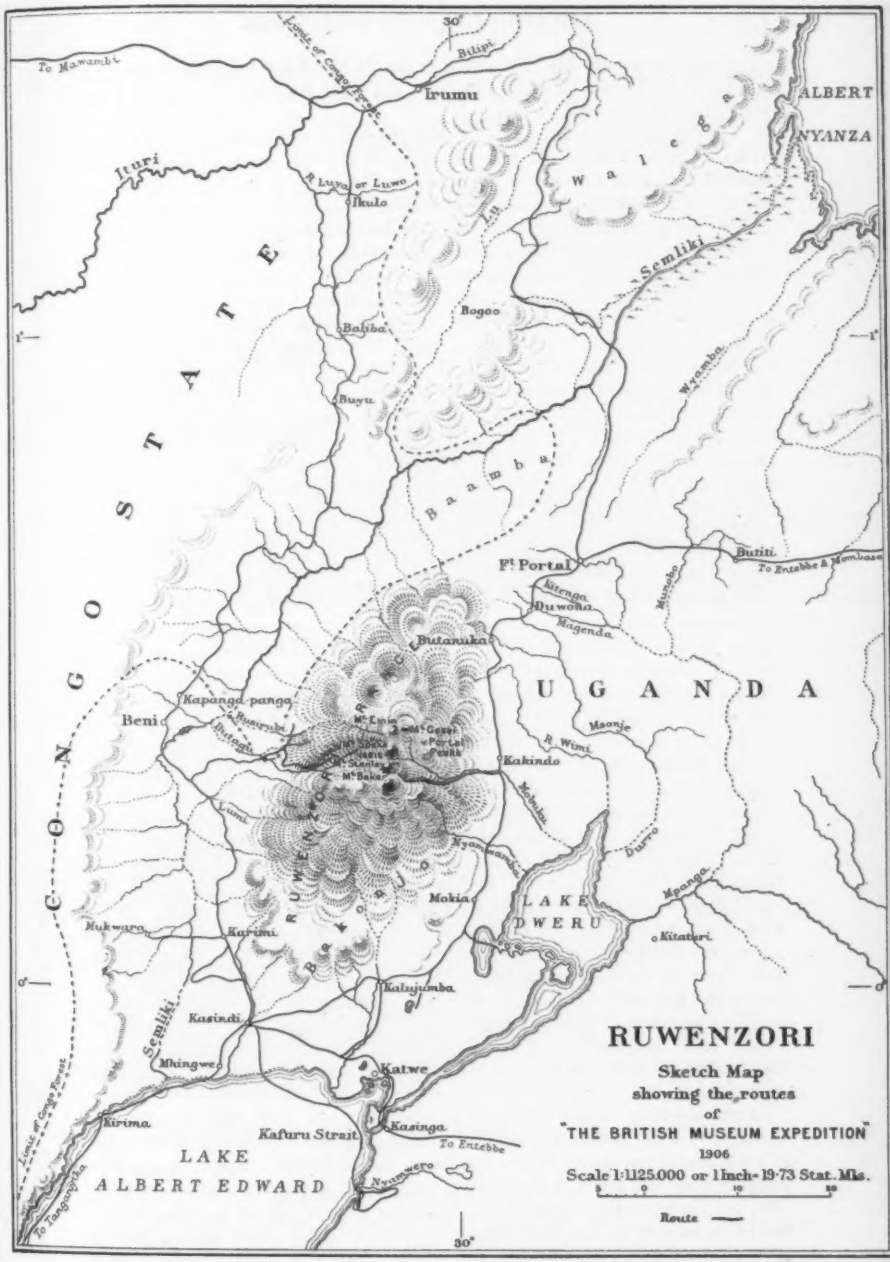
* Read at the Leicester Meeting of the British Association, August, 1907.


To Mawambi
Limit of Congo Forest
Bilipi
30°
Irumu
ALBERT NYANZA
Ituri
R. Lura or Luwo
Ikulo
Lamia
Wa l e g a
Semliki
CONGO STATE
Bajiba
Bogoo
Buyu
Wramba
Baamba
Ft Portal
Butiti
To Entebbe & Mombasa
Kirenga
Duwoha
Mingenda
Mundabo
Butanuka
Kapanga-panga
Beni
Ruwenzori Range
Mt Emin
Mt Speke
Mt Gessi
Mt Luigi di Savoia
Mt Stanley
Mt Baker
Portal Peaks
UGANDA
Maonje
R. Wimi
Kakindo
Mohokoro
Lumi
Nyamwamba
Mobia
Durro
Mpanga
LAKE DWERU
Mukwaro
Karimi
Kitatiri
Kalujumba
Kasindi
Semliki
Mhingwe
Katwe
Kirima
Kafuru Strait
Kasinga
To Entebbe
LAKE ALBERT EDWARD
Nyamwero
Limit of Congo Forest
To Fangophia
30°
RUWENZORI
Sketch Map
showing the routes
of
"THE BRITISH MUSEUM EXPEDITION"
1906
Scale 1:1125.000 or 1 Inch = 19·73 Stat. Mls.
5 0 10 20
Route

culminating rather south of the middle in the cluster of highest peaks of snow and patches of black rock. Towards the north the ridge ran down gradually in a long slope nearly to Lake Albert.

The first camp was formed in the Mobuku valley, on the east side of the range, at an altitude of 6500 feet, and was occupied for four months. From it short expeditions lasting for eight or ten days were made up to the higher regions and snows, and it was from this camp that the greater part of the collection was made.

The impenetrable nature of the forest and bamboos, and the almost total absence of native paths on Ruwenzori, except from village to village below 7000 feet, prohibit much exploration without considerable expense in cutting roads.

The inhabitants of the east side of Ruwenzori are Bakonjos, a peaceful, hard-working tribe, with whom we were upon most friendly terms. As a rule the lower limit of the forest belt is the limit of native habitations, but in the Wimi valley the Bakonjos have made a large clearing in the middle of the forest at 8000 feet, and have built a village, which was the highest point at which human habitations were found upon the mountains. They subsist almost entirely upon vegetable food, beans, colocasia-arums, and a small species of millet being the crops cultivated. Bananas are only grown in the lower valleys. They own small herds of goats, but seldom kill them for food, although they are fond of flesh and eat the hyrax, in pursuit of which they make expeditions as high as 12,500 feet. This is the origin of the path to the snows in the Mobuku valley. In the Wimi valley there is no path above 8000 feet, and the natives all say that it is because they do not hunt the hyrax in this valley.

From the Mobuku valley a move was made to the south end of the range, where another base camp was formed at an altitude of 3400 feet, and was occupied for two months. A dry country of short grass and acacia trees extends around the south of Ruwenzori down the Semliki as far as the Lumi river, and from that point to Fort Beni the road passes over open undulating plain, covered with spear-grass and with many tall borassus palms dotted about. From Fort Beni nearly to the north end of Ruwenzori, the Semiliki valley is overspread by the Congo forest, which extends up on to the lower slopes of the mountains. This part of the Semliki valley and Ruwenzori is almost unexplored; at the time of our visit the tribes dwelling there had rebelled against Belgian authority, and we were unable to enter it. There is no doubt that cannibalism is still practised in this district, and also by the Baambas on the north-western slopes of Ruwenzori. Between Lake Albert Edward and Fort Beni the Semliki is a shallow sluggish river, and there are no rapids in this section; below Fort Beni shortly after it enters the forest, there is a dangerous rapid, and probably there are more lower down in the forest. It is a noteworthy fact that no crocodiles were seen nor any traces of them found either in Lake Kivu or Lake Albert Edward or the upper part of the Semliki above the rapids, and the natives all insist that they do not exist there; but in Lake Albert and the lower part of the Semliki crocodiles abound, and are always to be seen, as also in Lake Tanganyika and the Congo rivers. Why there should be none in Lake Albert Edward is a mystery; the rapids on the Semliki would certainly not explain it.

From the camp at the south end another move was made round into Belgian territory, with the intention of making a third camp on the west side of the range in a position corresponding to the first camp in the Mobuku valley. A suitable camping-place was found in the Butagu valley at an altitude of a little over 7000 feet; but, unfortunately, owing to the rebellious state of two of the tribes at the foot of the mountains, it could only be occupied for three days, when matters became so unpleasant that collecting was out of the question, and the expedition was

compelled to beat a hasty retreat back to Fort Beni, the Belgian post on the Semliki river. This was a great disappointment, as no systematic collecting has been done in that district which lies on the west side of Ruwenzori, between the Butagu valley and the north end of the range. The Butagu is the largest valley on the west side,

THE GRASS ZONE BELOW 6500 FEET. DRACÆNAS IN THE FOREGROUND.

DENSELY WOODED RIDGES OF THE FOREST ZONE, WITH THE CLOUD BLOWING UP THE VALLEY.

and leads directly to the snows, but the river has not such a volume of water as the Mobuku on the east side. The south side of the Butagu valley is very steep; the north side has a more gentle slope, and a little above 6000 feet opens out into a broad valley, at the bottom of which is a deep groove. This appears as if it had

been cut by the stream after the glacier which probably occupied the valley had disappeared.

From Fort Beni a hurried march was made through the forest to Trumu by an entirely unused road on the west of the Semliki valley, no inhabited villages being seen, nor food for carriers obtainable for nearly 100 miles. This is probably one of the most uninhabited parts of the whole Congo forest, and the numbers of elephants and buffaloes which frequent it are extraordinary. During the heaviest rains, in October, November, and December, great numbers of elephants leave the forest for the more open parts of the Semliki valley. About 6 or 8 miles before reaching Irumu the forest comes to an abrupt end, and open rolling country of tall grass with patches of forest in the hollows takes its place. From Irumu a well-used road was followed back to Fort Portal. Shortly after leaving Irumu, this road passes over low hills which form the watershed of the Nile and Congo rivers, and extend along the west bank of the Semliki to the mountains on the west of Lake Albert Edward. Camps were formed for a short time in the Wimi valley and at the north end. After this the expedition set out on the return journey to England, travelling through the Congo forest to Boma on the West Coast.

At the present day this is an easy journey to make provided the sanction and assistance of the authorities of the Congo Free State have been obtained. From Fort Portal the road taken passed through Irumu, where we had been before. From Irumu, a march of eleven days through the forest, along a well-kept path, brought us to the next Belgian post, Mawambi. Here it was necessary to change carriers and engage fresh ones for the march of eight days to Avakubi, on the Aruwimi river. From this point on the Aruwimi dug-out native canoes are used for all transport, and in this manner we continued our journey down to Basoko, where the Aruwimi joins the Congo. There are many dangerous rapids on the Aruwimi, and at each it is necessary to unload the canoes, which are then taken down the rapids by expert canoemen, while the baggage is carried round to the smooth water below by the women, who do all the work of carriers in the Aruwimi district, the men only working as canoemen.

At Basoko we said good-bye to canoes and canoemen, but not without regret, and embarked in the steamboats which are now running regularly up and down the Congo. From Basoko ten days brought us to Leopoldville, at the head of the rapids, where it is necessary to disembark, the remaining journey of two days to the coast being made by railway.

General Features of Ruwenzori.

Ruwenzori is a mountain range lying just north of the equator, forming a long ridge between Lakes Albert and Albert Edward. The range is about 65 miles long by about 30 broad across the widest part, and does not run due north and south, but rather north-north-east and south-south-west. The highest part of the ridge is formed by a cluster of peaks a little south of the middle, at the point where the range is broadest, one of the peaks attaining an altitude of 16,816 feet (altitude obtained by H.R.H. the Duke of the Abruzzi). The slope of the west side of the range is very much steeper than that of the east, and the distance from the foot of the mountains to the watershed considerably less.

At the south end two long narrow spurs project from the main mass into the Albert Edward plain, almost reaching the shore of the lake. At the north end of Ruwenzori, the lower slopes gradually subside into the high country of over 5000 feet which surrounds Fort Portal, and extends along the east of Lake Albert. But the main ridge, at this point quite narrow, extends to within a few miles of Lake Albert. The glaciers and permanent snow-fields of Ruwenzori are only insignificant

remains of what they must have been during the glacial epoch, and an area of 10 miles long by 8 miles broad contains all the permanent snows at the present day. One of the most characteristic and unpleasant features of Ruwenzori is the cloud which almost perpetually envelops the upper regions of the range by day. Looking down from the mountains in the early morning, the clouds can be seen forming into a mass which gradually rises and drifts up into the range, all the while receiving reinforcements from the hot, damp atmosphere, which is invisible below during the heat of the day, and only becomes visible cloud as it reaches the cool

MOSS ON THE TRUNKS OF THE TREE HEATHS AT 11,000 FEET.

higher levels of the mountains, till by 9 a.m. all signs of snow-capped mountains are blotted out, and from below travellers see nothing but a great bank of cloud apparently resting upon a high ridge. This is the real reason why Ruwenzori remained undiscovered for so long, although several travellers approached within sight of it before its actual discovery by Sir Henry Stanley in 1888. The part of the range which is usually covered by cloud, is from about 9000 feet up to the summit on the east side (on the west the cloud descends lower), and these regions have consequently an excess of moisture which, together with the constantly warm temperature, has produced the extravagant growth of mosses and lichens which are such a remarkable feature of Ruwenzori. The rainfall, which is abnormally heavy,

must be nearly 100 inches per annum, and is to a great extent local; but the wet and dry seasons, so far as they can be said to exist, correspond fairly well to those of the Toro district, which are as follows:—

January and the first half of February is the most reliable dry season. The latter half of February, March, April, and May are rather wet months; June, July, and August are usually dry, but not invariably so; September, October, November, and December are wet, the heaviest rainfall being in November and December.

There is a very marked contrast between the climate of the south end and the central portion of the range. At the south end the rainfall is much less, the vegetation is short grass and acacia trees, the whole district having a dry, arid appearance much like parts of South Africa; the same conditions occur at the north end, but not to such a marked degree as at the south. On Kilimandjaro, the south side is the wet side. The west side of the range has even a more humid climate than the east, and it receives considerably less sunlight owing to the cloud.

Above 6000 feet the temperature never rises very high, nor does it fall very low at the summit. In the Mobuku valley, the maximum and minimum Fahr. observed during four months averaged—maximum, 74·04; minimum, 58·16. At 12,500 feet the maximum observed was 51·5, and the minimum 36·0; and above snow-line, maximum 43, and the minimum 26. Ruwenzori feeds innumerable streams, of which the most important on the east side are the Mobuku, the Wimi, and the Nyamwamba. The Mokubu is fed by the snows, and probably the Nyamwamba is also. Several small streams from the north end unite below the mountains and form the Mpanga.

On the west side the Butagu is the largest, and there are two smaller streams south of it, the Lumi and Ululu. The Butagu is fed by the snows, and there is another river, the Rusirubi, a little north of the Butagu, which is also probably a snow-fed stream.

Life-zones of Ruwenzori.

Ruwenzori is divided into fairly well-marked zones of vegetation running concentrically round the ridge in belts, which can be most clearly shown in a diagram.

These divisions must not be taken as hard-and-fast lines of difference, for the edges of the zones necessarily merge gradually one into another, and specimens of the characteristic vegetation of one zone may often be seen in another, and there is always a difference between the altitudes of the zones in valleys or on exposed ridges. Neither is it intended to imply that the particular plants named constitute the only vegetation of the zone, such species being taken merely as the most conspicuous and characteristic of certain altitudes. The boundaries of these zones are not so well defined on the west side, and extend lower down than they do on the east, which may probably be accounted for partly by the more humid climate of the west side and Congo basin, and partly by the cloud-bank which accumulates before the sun has reached a position to shine upon the western slopes, thus sheltering them from its rays.

Grass Zone.—Commencing at the foot of the range and working upwards, there is first the grass belt, which is merely a continuation of the surrounding country of the plains, and extends up on to the lower slopes of the range to an altitude of 6500 feet on the east, and somewhat lower on the west, and includes most of the species of flora and fauna characteristic of the surrounding districts.

Forest Zone.—Above the grass the forest appears at 6500 feet, and extends upward to an altitude of 8500 feet. On a clear day when the cloud rests upon the higher part of the ridge, leaving the country below 10,000 feet exposed, an

instructive view can be obtained from Fort Portal. The forest belt appears as a well-defined dark band running the whole length of the ridge without a break, but diminishing in breadth towards the north end, until at the point where it turns over the ridge it is only a narrow strip about 100 yards wide, and a good deal mixed with the bamboo. On the west side the Congo forest joins with the Ruwenzori forest zone in the form of a broad tongue protruding across the north central part of the Semliki valley and extending right up on to the western slopes until it meets the forest zone. In many places the forest has been cut back several hundred feet by the natives clearing the ground for cultivation, and the large open spaces covered with fern which are to be seen among the forest are also old sites of native cultivations. From some of these clearings a view can be obtained over densely forested ridges rolling away on all sides until shut out by clouds above. The lower margin of the forest zone, especially in the valleys, is almost as tropical

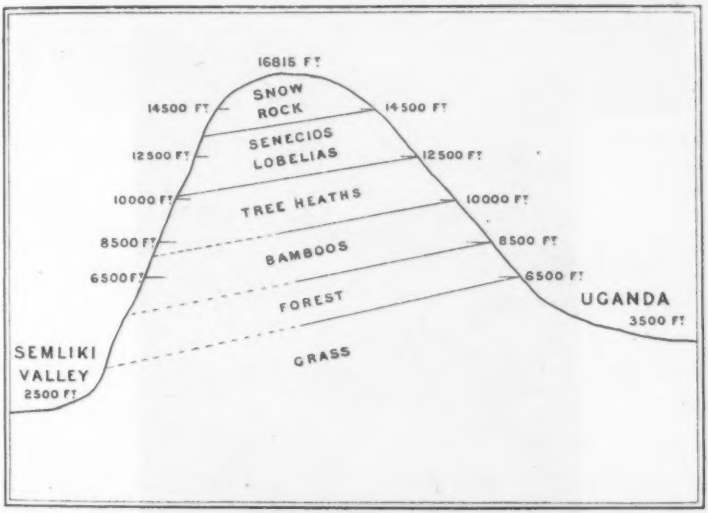


DIAGRAM OF THE RUWENZORI RANGE (VIEWED FROM THE SOUTH), SHOWING THE SEQUENCE OF ZONES OF VEGETATION, AND THE WAY IN WHICH THE LIMITS OF THE ZONES ARE LOWER UPON THE WEST.

in appearance as the forests of Uganda and the Congo, and here many species occurring in the Uganda and Congo forests are found also; but at 7000 feet much of the tropical nature of the vegetation disappears, and species of birds and mammals known only from Ruwenzori begin to appear. In this zone at 7000 feet appears the first of the lobelias, which form such a conspicuous feature of the higher regions; this species (*Lobelia giberroa*) ranges from 7000 to 8500 feet on Ruwenzori, and is found also on the mountains of Abyssinia. A fine species of conifer (*Podocarpus milanjiana*) appears at 8000 feet, in the upper region of the forest, and continues on the crests of ridges in isolated clumps throughout the bamboo zone to 9500 feet. Perhaps the largest tree is found in the lower valleys (*Pseudocedrela utilis*), which attains a great size, and is said to be a valuable timber tree. Up to this altitude in the grass and forest zones, life is abundant;

there is a large variety of small mammals, and on a bright morning the forest is teeming with bird-life, but above the forest there is a marked contrast, and as the higher regions are reached signs of life become still less.

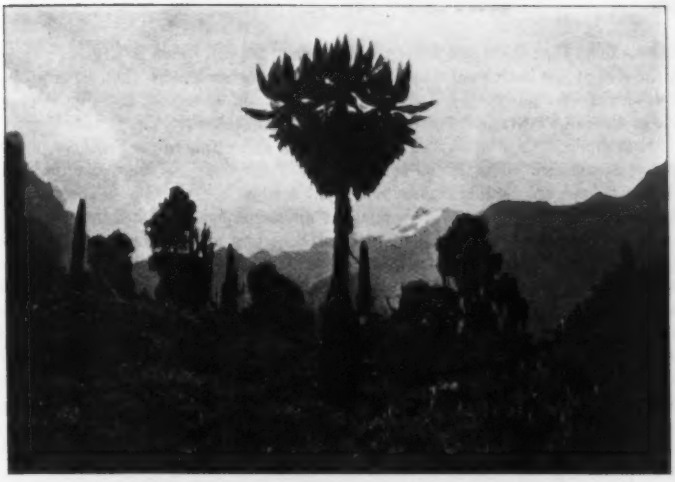
Bamboo Zone.—The bamboo zone, which comes next above the forest, may be taken as extending on the east side from 8500 feet to 10,000 feet, and on the west from 7000 feet to 8500 feet.

Where it is unmixed with forest it is impenetrable without cutting a path, for the older bamboos, having fallen, are lying across between the stems of the others, and make a most effectual barricade. In these dense jungles of bamboo there is

TREE HEATHS AT 12,000 FEET. MOUNT BAKER IN THE BACKGROUND.

little or no life, the birds preferring the more open parts, and the mammals, with the exception of monkeys and chimpanzees, finding no food to attract them thither. These latter frequent the bamboo zone in search of the young shoots, and traces of chimpanzees were found as high as 10,000 feet.

Tree-heath Zone.—At 10,000 feet the tree-heaths (*Erica arborea*) are abundant, and extend in a dense forest up to 12,500 feet, and although they appear a little below 10,000 feet, and continue a little above 12,500 in isolated clumps, the typical zone of tree-heaths may be taken as extending from 10,000 to 12,500 feet. This zone forms a broader belt than the others, especially upon the west side, where it



VEGETATION AT 12,000 FEET. TREE HEATHS, LOBELIAS, AND GIANT GROUNDSELS (SENECIO) STANDING AMONG EVERLASTING FLOWERS (HELICHRYSUM).

LOBELIA DECKENII AT 12,000 FEET.

extends more than 1000 feet lower than on the east, and there is a great contrast in the size of the individual trees of heath, which are not more than 10 or 15 feet high on the west side at 10,000 feet, while they attain 40 feet or more on the east side at the same altitude. Possibly they are of a different species.

It is difficult to give any idea of the weird and extraordinary scenery of this part of Ruwenzori. The trunks and branches of the trees are wrapped up in thick coats of moss, huge swollen masses of it in all manner of grotesque shapes hanging from every stem. The trees are leaning at all angles as if weighed down by their burdens of wet moss. Generations of dead ancestors are lying across each other upon the ground, covered over with a treacherous layer of soft moss a foot or more deep, making the walking difficult and dangerous, for these fallen trees are not soft rotten wood, but well preserved and hard as steel. At this altitude the bottoms of the valleys are frequently flat peaty bogs, destitute of tree-heaths, and here may be seen one of the most conspicuous of the lobelias (*L. Deckenii*), a species which occurs also on Kilimandjaro. This particular species seems confined to these flat bogs, and was never seen among the other lobelias on the sloping hillsides. Another species of lobelia found in this zone is *Lobelia Stuhlmanni*, which ascends to about 12,000 feet, where it is replaced by a somewhat similar species (*Lobelia Wollastoni*), which is the dominant species above the tree heaths, and flourishes up to 14,000 feet.

In this zone, at 10,000 feet alpine forms begin to appear, the pretty silvery leaves of the alchemillas often thickly covering the swampy ground. The giant groundsels also begin at about 10,500 feet, but are most plentiful above 12,500. This species (*Senecio adnivalis*) is found only on Ruwenzori, but is closely allied to *Senecio Johnstoni* from Kilimandjaro, and another nearly allied form is found on Mount Kenia. Very few birds inhabit these wet and gloomy regions, and the total number recorded as seen in the tree-heath zone only amounts to fourteen species, one of which, a beautiful sun-bird (*Cinnyris Stuhlmanni*), is remarkable in being absolutely confined to a belt of a little more than 1000 feet, occupying the upper margin of the bamboo and the lower half of the tree-heath zone.

Lobelia and Groundsel Zone.—At 12,500 feet the tree heaths cease, and from this altitude almost up to snow-line the stately lobelias and fantastic senecios form the characteristic vegetation. Everlasting flower bushes, which are conspicuous a little above 11,000 feet, also grow in profusion, and continue above the senecios, which disappear at about 14,000 feet. The ground here is soft black mud, covered over with deep moss of many shades of green and yellow. The lobelia which forms such a feature of this zone is a species new to science (*Lobelia Wollastoni*), known only from Ruwenzori, but is closely allied to a species (*Lobelia rhynchopetalum*) from the mountains of Abyssinia at 11,000 to 13,000 feet. *Lobelia Deckenii* is also to be seen as high as 13,000 feet, growing on the more level ground in the valleys.

Another remarkable sun-bird of a dark metallic green (*Nectarinia dartmouthi*) inhabits this zone, and is absolutely confined to it, never being seen below 12,500 feet among the tree heaths, but seeking its food only among the blue flowers of the lobelias.

Snow Zone.

Permanent snow lies at about 14,500 feet, and as Ruwenzori is practically on the equator, the snow-line is constantly at the same altitude, so that there are no birds or mammals which show any seasonal change of colour on account of the snow, nor are there any Palæarctic forms, although among the flora there are many alpine genera. No birds or mammals live above the snow-line. Butterflies, moths, and diptera were seen on the snow up to 16,000 feet, but they were only accidental

stragglers from below, and not residents. On the bare rocks above the snow a few lichens and mosses were seen.

It was most unfortunate and disappointing that the expedition was prevented from making systematic collections on the west side, for there is so little material from the west that a comparison of the two sides is hardly possible at present. Of the birds, although only a few were obtained on the west side, we saw and heard sufficient to enable us to say that all or nearly all the species which inhabit the east side above the grass zone—that is, above 6500 feet—are found also on

LOBELIAS AND SENECHIOS AT 13,000 FEET.

the west. Many small mammals known from the east side were also identified on the west, and it will probably be found, when sufficient material has been obtained, that the fauna above 6500 feet is identical on the east and west sides of the range.

This is true also of the flora in general, but from the hurried observations we were able to make, we were inclined to the opinion that there are numerous plants upon the west side which are not found on the east.

A detailed account of the distribution of the fauna on the range, in many instances confined absolutely to certain zones, would take too long to give, but a short outline of the birds and mammals may be of interest.

The larger mammals, such as elephants, buffaloes, water-buck (*Cobus defassa*), kob (*Cobus thomasi*), reedbuck (*Cervicapra arundinum*), and bushbuck (*Tragelaphus*

scriptus), which inhabit the plains and low foothills, do not ascend the mountains above 5500 feet except the bushbuck, which occasionally follows up the valleys into the forest as high as 7000 feet. Pigs are plentiful up to the limit of the forest, but do not go higher than that. In this part of Uganda the lions prey almost exclusively on the wild pigs, following them up the mountains, and on this account lions may very occasionally be seen up to 7500 feet. Leopards are found as high as the snow-line, but they are only occasional visitors above 10,000 feet, and are really inhabitants of the grass belt and lower forest region; two small red duikers (*Cephalophus johnstoni* and *C. rubidus*) are known from Ruwenzori, and range up to 10,000 or 11,000 feet.

Two species of monkeys inhabit the forest zone (*Cercopithecus stuhlmanni* and *Colobus ruwenzorii*), and baboons are not uncommon among the dry grassy hills at the south end below 7000 feet, while chimpanzees may often be heard in the forest, and are found up to 10,000 feet. The forest and lower slopes support a large variety of smaller mammals, a few of which, such as *Mus denniæ* and *Lophuromys aquilus*, continue almost to snow-line. A single species of hyrax occurs on Ruwenzori, and is found from 10,000 feet up to 14,000 feet, but is most plentiful in the tree-heath zone. A large serval cat inhabits the same regions as the hyrax, upon which it preys, but with the exception of these, the resident mammals above 10,000 feet are only very small rodents or insectivorous animals. There is also one species of fruit-eating bat known only from Ruwenzori, which occurs from 11,000 to 13,000 feet, and is the only bat found above 10,000 feet.

Of the resident birds of Ruwenzori, the majority are of small size—kites, buzzards, and ravens being the largest found upon the mountain. In the grass zone and lower slopes, *Cisticolas* and small finches, such as *Cryptospiza*, *Estrelda*, and *Pyromelana*, are largely represented; but in the forest zone these disappear, and many species of flycatchers and small warblers take their place. Sun-birds, both *Nectarinia* and *Cinnyris*, are numerous in the forest and below. One of these (*C. regia*) is known only from Ruwenzori, and is confined to the forest and bamboo zones. Another (*C. stuhlmanni*) is found only from 10,000 to 11,000 feet, and a third (*Nectarinia dartmouthi*) inhabits only the zone of lobelias and senecios above 12,500 feet. This latter is peculiar to Ruwenzori, but is nearly related to a species (*N. salvadorii*) from Nyasaland. Two species of turacos are found on Ruwenzori, one (*Turacus emini*) being plentiful in the Congo forest and on Ruwenzori up to 8000 feet, where it is replaced by another somewhat similar species (*Gallirex johnstoni*), which continues up to 11,000 feet. *Francolins* are found up to 8500 feet, but are not plentiful. Near the summit of the range, frequenting the steep cliffs near the snow, is found the largest swift in the world (*Cypselus maximus*), which lives at a greater altitude than any other bird on Ruwenzori, and is peculiar to it. A few birds were discovered on Ruwenzori, which were previously known only from the Cameroon mountains of West Africa. Among these there is one remarkable bird, a large yellow shrike (*Laniarius lagdeni*), of which only one specimen was known to exist in collections. A pair of these birds were seen on Ruwenzori, and one was obtained, and this is the only other specimen which has ever been obtained.

I should like to be able to say that we had found birds or mammals with special adaptations to the wet and cold of Ruwenzori, but nothing very remarkable in this way was noticed; on the contrary, the most numerous species inhabiting the wettest and coldest zone from 12,500 to 14,000 feet is a sun-bird of brilliant colour.

A species of sun-bird (*Cinnyris reichenowii*) which is found in East Africa is found on Ruwenzori up to 7000 feet. It then disappears, but at 10,000 feet another species appears which is its exact facsimile in every detail, but is twice the size of it.

There is a similar case among the plants, a lily (*Gloriosa virescens*) growing in the lower valleys of Ruwenzori which reappears as a very large-flowered form at the higher altitudes.

This increase in size is probably the result of cooler climate at higher altitudes, it being a well-known fact that the representatives of species inhabiting more northern latitudes are often larger than those found further south. For instance,

THE MUBUKU VALLEY BELOW THE GLACIER. GIANT GROUNDSELS IN THE FOREGROUND.

in the Himalaya we find a large race of the pied hornbill (*Anthracoceros affinis*), while in Burma its place is taken by *A. malabaricus*, a form distinguished only by its smaller size.

Some plants show slight modifications on account of the cooler climate at high altitudes. The lobelia at 7000 feet has large broad soft leaves, in contrast to the three species above 10,000 feet, whose leaves are long, narrow, and leathery, and the leaves of the everlasting flowers above 11,000 feet are more hairy than those of a species (*Helichrysum stuhlmanni*) from 6000 feet. Probably this is a provision of nature enabling them to withstand the cooler climate.

AN EXPLORATION OF THE MUSTAGH PASS IN THE KARAKORAM HIMALAYAS.

By AUG. C. F. FERBER, F.R.G.S.

A LONG-CHERISHED design of visiting the icy regions of Central Asia was greatly strengthened in me through reading Colonel Younghusband's most interesting book, 'The Heart of a Continent.' His climbing experiences on the Mustagh pass seemed to me especially alluring, and thinking that perhaps some sort of history might be connected with that pass, I made up my mind to visit it.

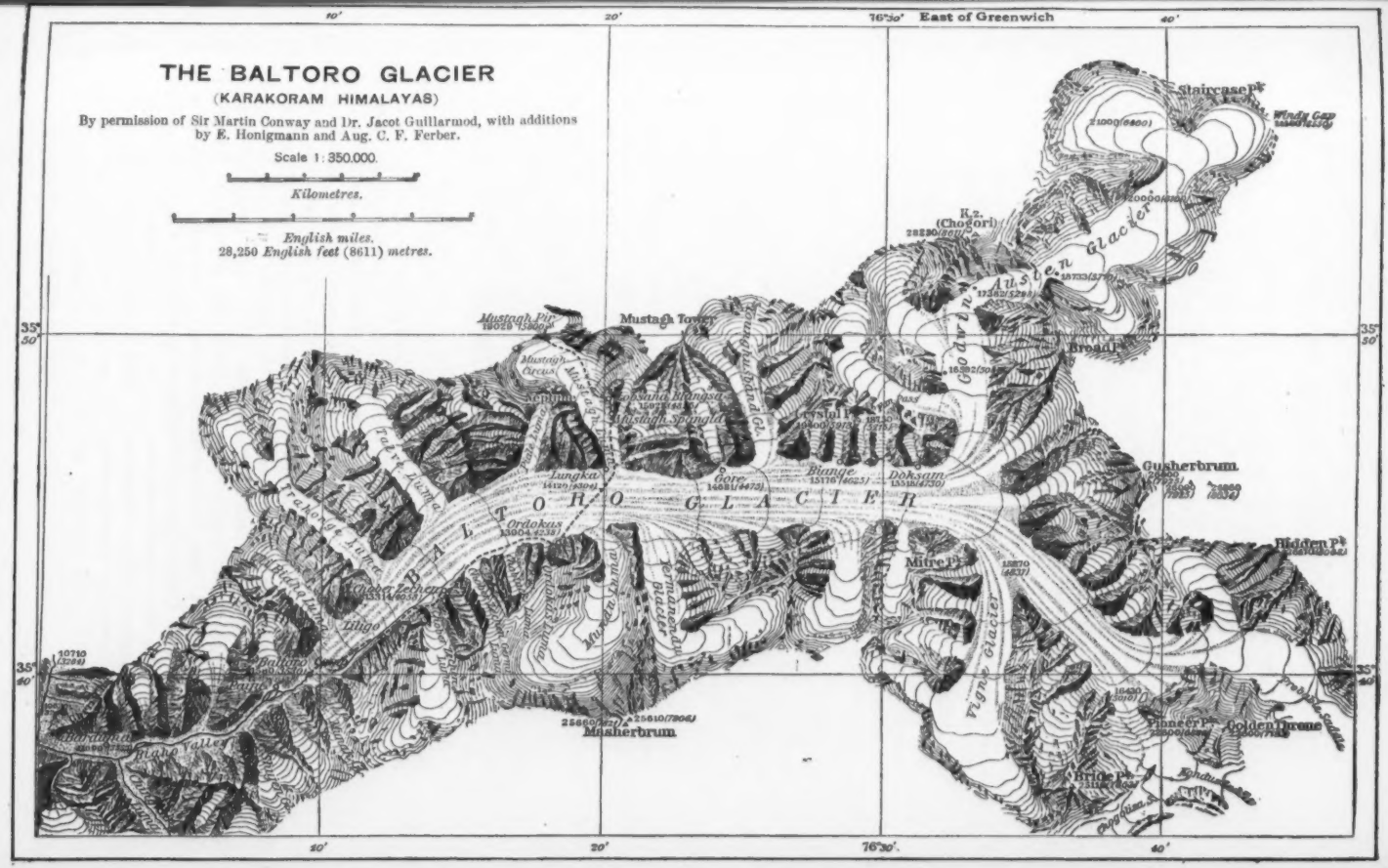
As to the general situation, let me mention that besides the Karakoram pass to the east and the Gilgit pass to the west of the huge Karakoram ridge, there is the Mustagh pass situated nearly in its centre, and offering a connecting link between Kashmir and East Turkestan. Representing the shortest route from Skardu in Baltistan to Yarkand, it lies to the north of the long Baltoro glacier, and very near Mount Godwin Austen, or K_2, or Chogo Ri (28,250 feet). For fifty years, more or less, it has been blocked by the advancing ice, however, so that the natives have abandoned it.

Before our attempt was made, this pass had only been crossed once by a European. This was Colonel Younghusband, who in 1887 came from Peking across the Gobi desert to Yarkand. Leaving this place, he tried the Mustagh pass, and finding that he could not cross it with his mules, he left them behind, and went on himself with a handful of courageous men, made a dangerous descent, and safely reached Askole, the nearest village in Baltistan. In 1892 Sir Martin Conway undertook an expedition up the Baltoro glacier, and mapped it. His book, 'Climbing in the Himalayas,' proved to be very useful to us. The oldest description of this part of the Himalayas was contributed to the pages of the *Journal* of the R.G.S. by Colonel Godwin Austen, in the year 1864. A recent publication on the subject is Dr. Jacot Guillarmod's work, 'Six Mois dans l'Himalaya,' an account of Mr. Eckenstein's expedition in 1902.

On September 8, 1903, my friend Herr E. Honigmann and I set out from Srinagar, the picturesque and dirty capital of Kashmir, with suitable equipment and attendants. It is unnecessary to give the details of our journey over the fairly well-known country between Srinagar and Little Tibet.

On the evening of the 16th we rode into Skardu, the capital of Baltistan; and on the morning of the 23rd we entered Askole, and in a shady garden the tiresome bargaining with the natives began. The whole village was aroused. Men, some with a semitical type of face, old women, and children besieged the low garden wall and took the keenest interest in the struggle. Happily we had sent to the place the day before to explain our intentions, otherwise they might have made themselves quite ill with excitement. We waited patiently until everybody had given his opinion, and then, when all were quieting down, began to make our arrangements.

Three people were of importance to us: the Lombardar or Mayor of Askole; Kitul from Teste, who explained that he had succoured the men whom Colonel Younghusband had to leave behind on the other side of the Mustagh pass, and therefore ought to be the guide; and Salman from Teste, who, having been a servant in Simla, and understanding Hindustani, was extremely valuable to us, as no one of the Kashmiri understood the Balti. He was the dandy of the place, wore boots, and had blue buttons on his shirt. The Lombardar showed us a few recommendations from travellers, among which I found one from Sir Martin Conway.


THE BALTORO GLACIER
(KARAKORAM HIMALAYAS)
By permission of Sir Martin Conway and Dr. Jacot Guillarmod, with additions by E. Honigmann and Aug. C. F. Ferber.
Scale 1: 350.000.
Kilometres.
English miles.
28,250 English feet (8611) metres.
10'
20'
76°30' East of Greenwich
40'
35° 50'
35° 40'
Staircase P.
Windy Gap
K2. (Chogori)
Godwin Austen Glacier
Broad P.
Mustagh Pik
Mustagh Tower
Mustagh Col
Mustagh Arête
Mustagh Glacier
Vigne Col
Vigne Glacier
Lungka
Ordokus
Gore
Biange
Doksam
Gusherbrum
Hidden P.
Mitre P.
Mitre Glacier
Abruzzi Ridge
Masherbrum
Pioneer P.
Golden Throne
Bride P.
Baltoro Glacier
Trango Towers
Paiju
Askole
20'
76°30'
40'

The daily stages we fixed as follows:—In the Biaho Valley: (1) Korofon; (2) Bardumal; (3) Paju, near the end of the Baltoro glacier. On the Baltoro glacier: (4) Liligo; (5) Chober Zechen; (6) Ordokas; (7) Lung Ka. On the Mustagh glacier: (8) Mustagh Spangla; (9) Lobsana Blangsa. On the Chinese side of the Mustagh pass: (10) Chang Tok.

Each coolie, of whom there were thirty-four in all, was to receive 4 annas a day and one seer, equal to 2lbs. of flour, and nothing more. But we promised that if they did their work well, we would give them presents in addition—a proposal which proved most useful. At last we were able to get away, passing at the end of the village two old square watch towers, fortresses in olden times against marauders, but now peaceful granaries. A beautiful species of broom with terra-cotta blossoms, and a pale blue thistle, afforded a bouquet ready to hand.

In the following description I shall use such names as the Balti gave me, and after them add in brackets the word I found in Sir Martin Conway's chart. A line in brackets means that no name was to be found in the chart. I do not assume that the names I give are the only correct ones, but took the precaution only to note those on which the Balti were unanimous. Luma means "valley," paro = "fireplace."

We crossed the foot of the Bio glacier (Biafo) and reached Korofon, from where a track leads up to the Laskam pass. A most beautiful view repays the slight trouble of mounting to it. Facing the valley to the left are the towers and peaks around the Punmah glacier, where possibly a way might be found to the so-called new Mustagh pass, of the existence of which, however, the natives always assured me they knew nothing. Then follows the upper Biaho valley, and in continuation of it the Ching Kang Luma (—), beginning opposite Bardumal, and closed in the far distance by an enormous snow-mountain. Right opposite on the left bank of the Braldu river stands a huge glacier-clad tooth, and from down the valley below the moraine-covered end of the Bio glacier, Teste's green gardens and fields send up their greetings. The second day we reached Bardumal, and on the evening of the third we camped near Paju (—), at the end of the Baltoro glacier. In the river sand we found gold, and I heard that an attempt had been made to wash it, which, however, did not pay. The sun was intensely hot. At noon we registered about 102° Fahr., and its rays were powerful enough to melt a spot of candle-grease which Mahud, our servant, had neglected to remove from my sleeve. One may imagine that a march in that stony valley, up and down hill, and with no shade, was not an ideal form of exercise.

On the morning of September 26 we entered the moraine labyrinth of the Baltoro glacier, the length of which is about 30 miles. The moraine is old and blackened by time and weather, and in some parts plants were growing on it. Walking up and down high and small moraine hills, we wended our way towards the left bank of the glacier. Lumps of frozen snow of the size of a man's head or even larger were lying about, and we could not make out their origin. After three hours' walk we reached Liligo (—), the 4th paro. This is a flat place, semicircular in form, covered with rounded stones, and shut in on one side by walls of conglomerate. We now followed the left bank of the glacier as far as Ordokas (—). Big blocks of ice, breaking off the glacier and falling into the watercourse we were following, made us cautious. In addition to these, the glacier sent down stones from its high muddy edge. In three hours' more we came to the first valley to the right, the Chober Zechen Luma (Liligua glacier), having a glacier at its upper part. Its grey waters flow into a small *märjelen lake* covered with large blocks of ice, children of the giant Baltoro. We stood on a high moraine hill at the west corner of the valley, right in the axis of a long valley opposite, the Trahongé Luma (Uli

Biaho glacier). On the other side of the Baltoro the mountains facing south are scorched by the burning sun. But little snow can be seen lying on their huge masses of solid rock. As far as the Mustagh Luma (Piale glacier) all these rocks look a light yellowish-brown, but higher up the glacier, dark blueish-black. The Balti called the valleys to the north of the Baltoro and beginning at its end as follows: (1) Uli Biaho Luma (—); (2) Trahongé Luma (Uli Biaho glacier); (3) Talve Luma (Dunge glacier); (4) Piale Luma (Durni glacier); (5) Mustagh Luma (Piale glacier).

After having rounded the lake, we encountered a *mauvais pas*, and after an hour's walk reached Chober Zechen (—), the 5th paro. By now, without counting rest, we had been seven hours coming from Baltoro camp, but I should add that we stirred up the coolies to exertion.

The next morning at seven o'clock the thermometer inside our tent was at 25

CURIOUS ICE-FORMATIONS FOUND ON THE BALTORO GLACIER.

Fahr. The peaks of the mountains were gilded by the rising sun, and a fresh easterly breeze awakened us to another day's work. After drinking our usual cup of cocoa, we quickly took down and packed the tents and continued our way. We had still to follow for a little while the watercourse on the left bank of the glacier, and then to climb the granite moraine, quite fresh and light in appearance, which covers the glacier of the second side valley, to our right, the Chober Zechen Germi Luma (—). By 8 o'clock we had crossed the first half of the moraine, and stood right in the axis of the opposite valley, the Talve Luma (Dunge glacier). For the first time we were aware of the majestic cone of Gusherbrum (26,360 feet), which dominates the upper part of the Baltoro. After another hour we crossed the glacier of the third side valley, the Cho Blak Luma (—), the junction of which with the Baltoro is to be clearly distinguished, for both moraines, the one light, the other dark, flow side by side down the valley. We now again betook ourselves to the hillside, which at this point was lying a little away from the glacier, forming, with the high edge of the same, a small valley filled with avalanches. We had to cross a

fresh ice-avalanche that some glacier high up in the mountain had recently sent down, and then climbed over grass up to Ordokas (—), the 6th paro, a beautiful spot nearly opposite the Piale Luma (Durni glacier).

Remnants of baskets, covered with moss, tins, etc., told us that this was the place where Mr. Eckenstein's expedition had encamped. We sent our coolies out to get some wood, as Kitul told us that higher up there was none to be had. We had now for the second time to cross the breadth of the Baltoro glacier. The more we advanced the more we enjoyed this most striking view of the snow-covered mountains which line the south bank of the glacier. On the upper part we recognized Mitre peak, then follow a good many unnamed peaks, but right in front stands the light coloured Masherbrum (25,660 feet), showing an imposing structure of rock veined like marble—truly a beautiful mountain. Looking through the mouth of the Mundu glacier, we could see it in all its lofty grandeur, its winding arêtes leading up in the wildest curves to its majestic height. Lower down the Baltoro, peak follows peak, all waiting to be conquered. The moraine hills, sometimes of considerable height, made it difficult for us to plan out a track. At the middle of the Baltoro we had to cross two small valleys with rushing streams. Three distinctly different moraines cover its surface. On the left bank it carries big granite blocks and glimmer, the middle has smaller pieces of slate, and towards the right bank every mixture of different-coloured stones may be found, amongst others, serpentine and various kinds of marble. We were struck by the extraordinary appearance of some ice-pyramids, which stood out in striking contrast with the moraine, and the origin of which we tried in vain to discover. After three hours' walking—the coolies this time taking twice as long—we reached the 7th paro, Lung Ka (camp 14,120), a deep and sandy hole at the west corner of the Mustagh Luma (Piale glacier), which looked too unattractive to camp in.

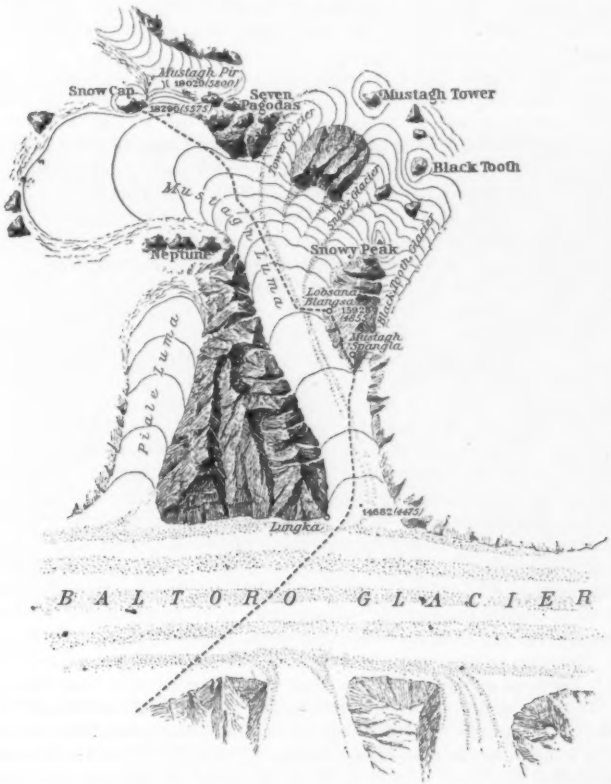
Now at last we were at the entrance of the longed-for Mustagh valley. The charm of the expedition was now to begin, as we put our foot on territory that had been visited by a European only once before, and then was not fully explored. At length we climbed the south corner of a grassy slope, surrounded by ice, the Mustagh Spangla, from whence we could study the whole valley. Deducting the rests, it took us 6½ hours to get there from Chober Zechen.

The Mustagh glacier fills the somewhat long and winding valley, is slightly undulating, and has but little fall. It carries two moraines, which cover only a very small part of the ice, in distinction to the Baltoro glacier which was entirely covered with stones, and, seen from there, presents the appearance of a broad expanse on which the contents of numerous mud-carts had been emptied side by side. Near its left bank the Mustagh glacier has a narrow strip of seracs.

On the right bank stands a line of roof-like peaks all similar one to another. It is curious to watch the difference in their appearance as you look up or down the valley. Looking up, only rocks with very little snow are to be seen; looking down, you see their north side covered with ice and snow. The upper part of this line of peaks finishes in a gigantic rock-mountain of three peaks, which suggested to us the name of Neptune. This mountain terminates the lower neighbouring valley, the Piale Luma (Durni glacier). No glacier is to be found on the west side of the Mustagh Luma, the huge Neptune only is covered with ice on its north side, concealed from our view.

The left bank is longer, less precipitous, and flanked by higher mountains. Four large and rugged glaciers, of which the last one is the Mustagh pass, are tributary to the valley. One part of the bank consists of a grassy slope covered with stones, not precipitous, and affording food to numerous ibex. As mentioned before, we were standing at the south corner of this slope.

The next morning, walking up the slope, we found, to our surprise, twenty-two huts. These were deserted and in ruins, undoubtedly a sign that this pass had been used in former times. In one of them Kitul showed us a grave marked by an upright stone. We were glad to take a few spars for burning, which were all that were left of the roofs. A little higher up we met with a second surprise in the shape of a level spot called Chagaran (—), about 800 feet long and 150 feet wide, which the natives told me was in former times used for polo, played on foot by people of Yarkand and Baltistan, who used to meet here.



SKETCH OF THE MUSTAGH VALLEY. SAME SCALE AS SIR MARTIN CONWAY'S.
1 INCH = 2 MILES.

After 1½ hour's easy walk we reached the end of the slope at a lovely spot called Lobsana Blangsa (—), where a hermit used to live, after whom the place is called. A little brook of beautifully clear water and a carpet of succulent grass suggested the very place to camp. The distance from Baltoro camp, or Paju, is about fifteen hours' march, not counting the rests, only much depends on the coolies, who will easily take double the time.

We were now at the same height as Mont Blanc, and only 1250 feet above the

end of the Mustagh valley. Towards the south the scenery is framed like an enormous stage. Below one sees the junction of the Mundu and Mustagh glaciers with the broad Baltoro, and a splendid background is formed by Masherbrum and its neighbours. Looking up the valley, a moraine of considerable height, belonging to the second side glacier, bars the view, so that only the summits of a few peaks can be seen, one of them having the form of a round cap and lying to the west of the Mustagh pass. At the foot of this moraine we saw a few stones arranged in a semi-circle and blackened by fire, which made us believe that the place had been visited not so long ago. We found edelweiss, primroses, rhubarb, and a beautiful yellow moss, which adhered firmly to the stones and occurred here and there in round patches.

The Balti seemed to me a hardy race. At night the thermometer fell considerably below the freezing-point. The people lay down to sleep in two lines close together, with their faces to the ground, those of one line putting their feet against those of the other. They had taken off their coats and used them as rugs, wrapping themselves up in them. Short wide trousers, a thin coat, a woollen belt, turban, and putties were all they had on. On the glacier they used mocassins; on the rocks, however, which they preferred much to walk upon, they went barefoot, and many of them were greatly troubled with chapped heels. They sometimes suffered from headache, which we cured by wrapping up their heads and keeping them warm. Nearly all of them had splendid teeth and sound and healthy gums. Beards were the rule. The moustache they wore cut short over the lip, as well as the hair on the middle of the head, but long black curls fell over their ears. It was amusing to observe their simplicity of mind. Having sun and meal enough, they were happy and content. They were friendly disposed, but somewhat slow, and only quickened their movements when a bakshish was in sight. If they asked for one, a thing that often happened, they put both hands together, as though praying, and bent their heads. When receiving the money, they still kept their hands joined, but opened them cupwise, wherein the daily wage of four annas, a silver coin of about the size of a threepenny-piece, looked microscopic. They all ate "roti," a coarse loaf, thin and round, about the size of a dinner-plate, which they baked every morning in ashes with the greatest care, smacking their lips the while. Their drink was tea, which they called "cha." The bread seemed to us most indigestible, but later on we were often obliged to use it, though not to our advantage. Words often failed me to describe the manifold beauties which this country affords. In the evening the sky was of a dark steel-blue, and the snow-covered giants reflected its cold light. The stars twinkled more brightly and persistently than in our hardest winter night. Far down on the horizon the new moon stood out on a background of red sky. It was as though a great fire were burning there. The Balti were sitting near the fire, talking quietly. Now and then the noise of falling stones filled the air with warning voice, otherwise deep silence reigned. The words of Schiller were brought home to me—

"Es gibt im Menschenleben Augenblicke
Wo er dem Weltgeist näher ist als sonst."

But poetic reveries often have their disadvantages, for whilst I was dreaming a hungry field-mouse nearly demolished my slippers. In order to keep warm at night we had to use everything we could. The unpleasant draught which pierced our beds from below we checked with American cloth. In addition, we had a couple of rugs and a sleeping-bag of sheepskin. We kept on all our underclothes and also our caps, which we turned over our ears, and only after a glass of grog did we get warm.

The morning of September 29 arrived with all its possibilities before us. We

set out a party of twelve. Only three remained at Lobsana Blangsa, and the rest were sent to Baltoro camp to procure food. We took provisions for several days, as we intended to go as far as Chang Tok on the Chinese side, where, as Kitul said, wood was to be had. From there we intended to rearrange our plans. We were accompanied by the cook, Ahamdu, carrying, as a special favour, his pots and pans himself; Mahud bringing the camera, etc., and Abdullah Lu, the tiffin coolie. There were also a coolie carrying a small tent, two more with our bedding, one with wood, one with flour, one with tinned meats, etc., and the guide, Kitul, with 53 yards of rope.

At 7.15 a.m. we started crossing the seracs of the Mustagh glacier in steps we had cut the day before, and then proceeding on the moraine on the flat part of the glacier. After half an hour's walk we were opposite the second large side glacier that from its curved form we called Snake glacier, and which forms part of a large

THE MUSTAGH PASS. TO THE LEFT, SNOW CAP; TO THE RIGHT, THE FOOT OF SEVEN PAGODAS.

mer de glace that lies here bedded between high peaks. As a matter of convenience, we gave names to the different peaks, glaciers, etc. The Snake glacier takes its origin at the north-west side of a rocky tooth, the Black Tooth, where the glacier of the same name begins, the seracs of which we had been crossing just before reaching Mustagh Spangla. Halfway down the Snake glacier is joined by another competitor, which descends from Snowy peak right above Lobsana Blangsa. Walking on, the first moraine branches off towards the Snake glacier. Then follows a group of smaller towers, sending down a steep but not extensive glacier with moraines on each side. At 8.30 we reached the third glacier to our right, the Tower glacier, a deep curved valley filled with seracs and enclosed by steep rocks, with the Mustagh tower in the background. Its great height and the dark masses of its rock, which are lighter in colour near the summit, compelled our admiration. The overhanging snow on its north-west arête made us think that the side hidden from our view might be a glacier-covered roof similar to those of the other

mountains. The Tower glacier brings down the second moraine. The Mustagh valley now takes a sharp turn to the west. We rounded the foot of Neptune, the north side of which, with its covering of ice and snow, impressed us more and more. To the right of the curve is a group of rocky towers, the Seven Pagodas, which are connected by a snow saddle with a round snow-covered summit—the Snow Cap. This saddle is the Mustagh Pir (= pass), from which comes down the Mustagh Pir glacier, steep and full of crevasses. The valley at this point forms a circus, shut in by snowfields and glaciers of medium height, which are only diversified by a few smaller peaks. To the left of them, on the south-west, stands Neptune, and to the east Snow Cap, with the Mustagh Pir as the lowest saddle. We now found ourselves on fresh snow, making it necessary for us to be on the alert against hidden crevasses. In spite of this a Balti fell into one up to his hips, and remained there like a child that falls down and cries till some one comes and helps it up. At 9.30 we reached the foot of the Mustagh pass, about 2350 feet above Lobsana Blangsa.

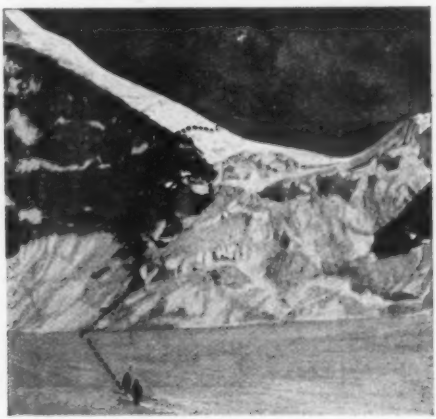


DIAGRAM SHOWING OUR ASCENT OF THE MUSTAGH PASS. TO THE RIGHT IS THE ROUTE CHOSEN BY HERR HONIGMANN.

The Pir glacier was impossible to climb, as it was full of crevasses. The right side near Seven Pagodas looked impossible too, and so our only hope left was the rocky wall supporting the Snow Cap west of the Pir glacier. Examining it through the glass, we remarked a narrow gallery beginning at the highest point of the old avalanche snow, and apparently leading up in an oblique direction towards the point where the Snow Cap arête joins the Pir glacier. The question was how to reach that gallery without exposing ourselves to falling stones on the avalanche side, or ice-blocks from the Pir glacier on the other. A few small balconies standing out of the lower part of the wall seemed to us the right place at which to begin. At first we climbed a short piece of avalanche snow, then reached the first balcony. From there we passed the ridge of a small roof-like snowfield, climbed the second balcony, crossed a second patch of snow about 50 feet long, and now reached the wall proper. An old wooden contrivance which we found here, such as coolies use for carrying loads, made me believe that this was the place where Colonel Younghusband descended. The trouble now was to reach the gallery, which was only

15 yards above us. We made every effort, but all our experience of the Dolomites proved useless, and we gave up the attempt in despair. In the mean time, stones had been falling to our left, but, as I gathered, from no considerable height. We shouted for our tiffin, and took an hour's rest making new plans.

We separated. Herr Honigmann preferred to try the ice couloir that leads up straight between glacier and rock, whilst I took my way to the left, trying to get to the gallery at a lower point. Such a place I actually found at the highest point of the avalanche snow. Only 3 to 4 yards of perpendicular wall separated me from it, and with the aid of a few crevices in the rock, I got up to it. The gallery was full of loose stones, some of them of considerable size, the more treacherous of which I pushed out with my foot. It varied in width from perhaps ½ to 1½ yards. Mounting it, I thought a solution had been found, when suddenly it ended at a very steep slope made up of stones, some of which were loose and only kept in position by frozen snow. When Mahud saw this he refused to go further on, and only Kitul accompanied me. Higher up, the rock was standing perpendicular out of the slope, making it impossible to cross there. So nothing was left but to descend a few yards, and then to climb this worst part of the ascent steadily and with the utmost caution, feeling my way at every step. Happily it did not take long, and I soon reached the end of the arête, which comes down from Snow Cap, at the point where it joins the Pir glacier. Here I was pleased to see my companion only a few yards away, standing in the middle of the ice couloir. He had done about 150 steps without any mishap, but now he said he could not go on without the risk of dropping into a crevasse. We threw him a piece of rope, and a few minutes later he landed safely at our side. We now continued the climb up the arête together. The rock began to be firmer, though a few places covered with ice gave us some trouble. The snow which lies on the pass came quite close to the edge of the precipice, sometimes leaving only room for our feet on the rock, whilst our fingers had to anchor in it. The higher we advanced, however, the less snow we found, and after three-quarters of an hour's climb it narrowed and flattened so considerably that we could get on to its surface without having to cut steps—and this at a point perhaps 30 yards above the lowest point of the pass and to the west of it. Colonel Younghusband seems to have undertaken his descent by going right down from the lowest point of the pass to the point where my friend and I met, thus crossing a terribly steep ice-slope—a remarkably courageous undertaking, especially for a man who had never put his foot on a glacier before.

We had achieved our aim. After 5 hours' work, at 2.45 p.m., exactly one month after our landing in Bombay, we stood on the top of the Mustagh (= ice mountain) pass, in the heart of the Karakoram (= black gravel) Himalayas, and on the watershed of the Indus and the Tarim basin. We were delighted at our success, and considered ourselves the more fortunate as we had not expected to finish the ascent that day. Kitul was the only one who had followed us. I am sure he did not understand why we had taken so much trouble. For men to climb mountains, to deprive themselves of all comfort; not to go for shooting even, but to come so far only for the pleasure of looking through a glass and writing in a book, will always remain a deep riddle to these people. We had a splendid sky, with no cloud; the thermometer in the sun was at freezing-point; that is, 70° Fahr. less than four days before under the same conditions at Baltoro camp.

We took the following measurements with a tested aneroid (so far as they had not already been estimated):—

The Mustagh pass, about 19,029 feet, lies—

739 feet	above	Mustagh circus	18,290 feet
3101 „	„	Lobsana Blangsa	15,928 „

4347 feet	above	the end of the Mustagh glacier, near Lung Ka	14,682	feet
5125 „	„	Ordokas	13,904	„
7449 „	„	Baltoro camp, at the end of the Baltoro glacier	11,580	„
8729 „	„	Askole	10,300	„
11,329 „	„	Skardu on the Indus	7,700	„

A snow saddle of a few hundred yards' width forms the pass. Towards the Mustagh circus we had the steep Pir glacier, whilst on the Chinese side the valley declines gently, forming a snowy trough. At first we examined the side that was unknown to us, but unhappily the view was obscured by a dark and lofty rock chain, lying not far away. Behind this another similar chain could be seen. The valley leading to Chang Tok bears to the west, round Snow Cap, which mountain, seen from this side, is entirely enveloped in white, and shuts Chang Tok, our original destination, out of view. On the eastern side of the pass the Seven Pagodas rear their lofty towers, only leaving room for a few smaller snowfields. Between these and a broad stony mass further on we could see the end of a big glacier, apparently coming down from the Mustagh Tower, which is hidden from here by the Seven Pagodas. The finest view is towards the south. Looking down the narrow windings of the Mustagh valley, we saw right below the junction of the Yermanendu, Mundu and Baltoro glaciers. In the saddle of the enormous arête which connects Masherbrum with its rivals to the east, we observed in the far distance the white shoulders of a very large snow mountain. Right opposite to us, huge masses of ice clinging to Neptune threatened death to anything in their way. For the first time the rarefied air began to affect us, as we could only take from ten to twenty steps in the deep snow without stopping or taking breath.

It had been impossible to persuade the coolies to follow us, and, in fact, for a man with a heavy load it would have been difficult in any case. After a short stay we began the descent, considering the possibilities of fastening ropes to help up our men. After three-quarters of an hour we gained the upper part of the gallery, glad now to find no more difficulties in the way. For 20 minutes we descended the gallery, when from the upper part of the avalanche snow we made a glissade, and after another 10 minutes leaped a crevasse, finding ourselves at the place where we had started. Allowing double time for the ascent, this could be done in 2½ hours, and counting for the march from Lobsana Blangsa to the foot of the pass another 2½ hours, the whole ascent would take 5 hours. I might note that climbers will find much to compare between the Zinal side of the Triftjoch in Switzerland and this ascent.

Judging from Younghusband's account, the ascent from the north to the Mustagh pass should present far less difficulty. This, together with our own experience, leads us to think that, with the aid of a few steel ropes and the blasting of the rocks in certain difficult places, *the way across the pass could be reopened as a regular means of communication for pedestrians.*

The coolies had not moved a single step the whole time. We saw the impossibility of doing anything with them, and determined to return. We spread out the wood we had brought, put flour and other things we did not want to take back upon it, and made our way to the camp with the firm intention of coming back and trying again the next morning. At 5.30 p.m. we left the foot of the pass, and, roped, went down at great speed. At 7.30 about dusk we reached the entrance to the seracs, when, from some unknown cause, a row took place between our cook and a Balti, the former losing his temper and hitting the poor Balti so badly on the knee-cap that it broke. This embarrassed us considerably. Happily the moon came up, and after a good deal of trouble and risk we reached the camp at last. To calm the Balti, we were obliged to make the cook help in carrying the wounded

man also. Thus bereft of our best men, and being obliged to look after our cooking ourselves, we saw no pleasant time before us. We should have to wait long, no

ON THE ROUTE UP THE MUSTAGH PASS, WITH SEVEN PAGODAS IN THE BACKGROUND.

doubt, to carry out our plan again, and, in any case, it would be doubtful whether these terrified coolies would accompany us.

In spite of the splendid weather and all precaution taken, we had both caught colds. I spent the day in walking up the Mustagh glacier with Mahud, in order to take a few snapshots. Passing the Snake glacier the barometer began to fall rapidly, and I had not yet reached the Tower glacier before a strong south-easterly gale began to blow. In a short time the sky was clouded, and quickly I turned towards the camp. Snow began to fall, and, feeling that we could do but little more, we built a stone man (pyramid), hiding a bottle in it containing some notes on our ascent. The next morning, the snowstorm continuing, we were compelled to leave. Not knowing enough of the weather conditions so late in the year, we were afraid of getting snow-bound. In fact, with the fresh snowfall, no more rock-climbing could be attempted. We took as much of our impedimenta as we could, being heavily laden ourselves, and left the remainder behind in the larger tent, which we fixed firmly with stones. At 8 a.m. we started, and reached Mustagh Spangla after 50 minutes' walk, crossed the seracs, and passed Lung Ka at 10.30. On we went

THE WESTERN SIDE OF THE MUSTAGH VALLEY, SHOWING THE MOUNTAIN RIDGE DIVIDING IT FROM THE PIALE LUMA.

for the Baltoro glacier. How glad we were to have marked our track by small heaps of stones, as under the present circumstances we should not otherwise have got through! At 1.15 p.m. we reached Ordokas. For a little while the clouds allowed us a peep at the rocky needles, now covered with fresh snow. But soon it became worse and worse again, and an icy-cold wind blew up the valley. At 3.50 p.m. we reached Chober Zechen, went around the lake in three-quarters of an hour, and arrived at Liligo at 6.45 p.m. On the morning of October 2 it was still snowing. Leaving Liligo at nine o'clock, we arrived in Baltoro camp at 11.30 a.m. Here we met with the rest of the coolies we had left behind. The Balti told us that all through the winter the snow never lies here for any length of time. The weather continued to be of the worst. At noon we registered 37° Fahr., instead of 102° Fahr. eight days ago. If there was a proportionate difference on the Mustagh pass, the thermometer there ought to have registered −33° Fahr. To warm ourselves we built another stone man on the top of an old moraine hill, and the next morning we left for a more inviting climate.

The clouds were hanging low in the valley, and it looked very threatening. Starting at 8.30 a.m., we walked on the stony path as quickly as possible, a biting wind searching us through and through. We passed Bardumal at 2 p.m., and at 5 o'clock crossed the torrent that comes out of the Dumordo valley. The next day, after four hours' walk, we entered Askole.

After the lonely mountain solitude the beauties of the upper Braldu valley were doubly appreciated by us. For hours we walked across cornfields laid out in terraces, passed numerous villages wooded with poplars and withies, hearing from below the noise of the turbulent Braldu river rushing through a canyon, and looking up to the snow-covered peaks and wild glaciers—a lovely place, the Zermatt of the future.

Arriving at Jummu in the Shigar valley, we were glad to find a raft, of which we speedily took advantage. Constructed out of twenty-four inflated sheepskins and kept together by wooden laths, it was steered by four people sitting at the corners. At 7.30 a.m. we left Jummu, and at 3.30 p.m. the castle of Skardu came into sight. Crossing the sluggish waters of the Indus, we entered Skardu near the polo ground, where the rajah and his party were indulging in the game. Near the filthy rest-house we pitched our tents, making preparations for our way back across the Deosai. Up to now the road was clear, but any day it might get blocked by snow.

On the morning of October 9, 1903, riding our ponies, we followed the poplar avenue that leads out of Skardu. Already the leaves had changed colour and were falling. We looked back with gratitude to the Mustagh chain when standing on the top of Burji La. We had been indeed fortunate enough to obtain our desire, and could never forget the impressions brought home with us of this glorious mountain scenery.

THE DISTRICT OF JAEDEREN, IN SOUTH-WESTERN NORWAY.*

By O. J. R. HOWARTH.

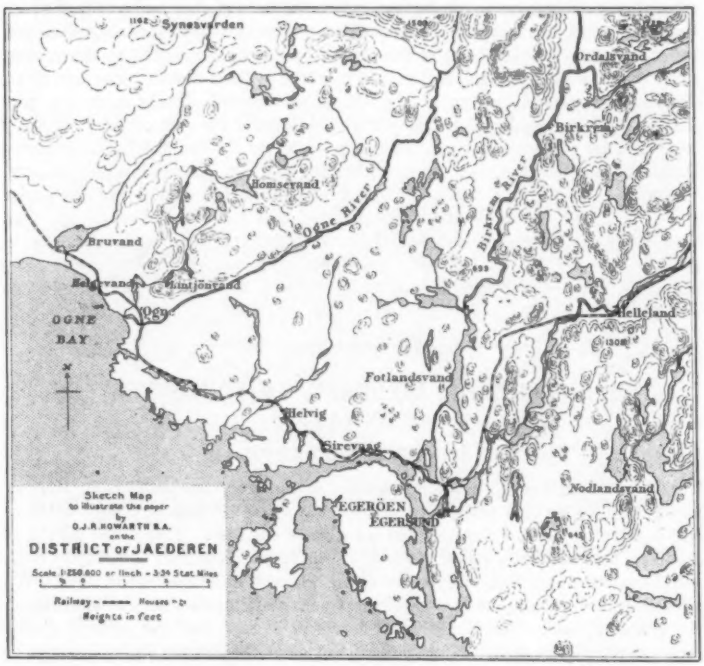
This paper describes the most noteworthy of the very few districts in Norway now having a coast-line practically without any fjords or islands, though evidence will be adduced to show that this was not always the case. This is the district of Jaederen, a district little visited, wanting in the scenic attractions of the fjord coast and the mountainous districts, yet possessing interests quite peculiar to itself. We are accustomed to associate the physiography of Scandinavia with glacial action on the grandest scale. But in few other localities, if any, does the effect of glacial action so completely dominate every other feature of the country as in Jaederen.

Jaederen is in the south-west of Norway, its coastal district being served by the railway running southward from Stavanger. In this direction we have some 30 miles of absolutely unbroken low coast, as unlike the Norwegian coast at large as could be imagined. It is a shingly shore, backed by a gently undulating moory foreland, full of peat-bogs, and extending some 3 to 8 miles back to the hills which rise inland abruptly. Next, shortly before the railway reaches the village of Ogne, the character of the coast abruptly changes. There are still no islands (save a few rocks), but the coast itself becomes rocky, at first with intervals of sandy beach, not shingle, and so continues until in the neighbourhood of the port of Egersund the coast resumes its normal character, protected by islands.

The transitional piece of coast belongs to the most noteworthy part of Jaederen

* Abstract of paper read at the British Association, Section E, August 1, 1907.

district. This is an area bounded by the sea and the low foreland on the one hand, and on the other by a sharp range of hills on the north, and also by high hills, and, approximately, by the Birkrem river on the east. On and beyond these boundaries, we have the beautiful and typical scenery of Southern Norway. But within these boundaries all is completely different. From the map the impression is gained of low hills rising in rounded semi-isolated clumps, the remarkably straight valley of the Ogne river cutting through their midst, many little lakes and marshes scattered among them. Actually, practically the whole is simply a tumbled tract of naked rock, or barren moor strewn with boulders. Rarely, here and there, enough soil has accumulated for a little copse of scrubby oaks to grow, but, for the rest, the country is utterly inhospitable. Occasionally the hills, or



rather great masses or piles of rock, stand up quite boldly. Perched boulders lie everywhere, set in some cases in well-marked orderly rows running diagonally across the present general trend of the valleys, following the line of the ice-flow as one sees it laid down on maps from this portion of the great Scandinavian ice-sheet, and sometimes of immense size and poised in remarkable positions. Perhaps the most impressive feature of the district is the extraordinary manner in which the rocks are piled and riven. For example, the valley of the stream tributary to the Ogne river which drains Lintjön and Helge lakes, is at one point entirely blocked by boulders, and makes its way through a cleft between them.

It has been shown that the coast is without islands, or practically so. But the island fence did once extend thus far, and this bit of coast which has now only one small and shallow inlet which can be called a fjord, namely that of Sirevaag, had

once several small fjords, just as has the coast further south. At the southern extremity of the low foreland the lake of Bruvand lies quite close to the sea. The stream draining it crosses a narrow neck of land traversed by the railway and the road, and then enters a large lagoon, separated from the sea by a sand-dune, through which the stream cuts a shifting channel. This condition of affairs is recent, and Bruvand is a curious lake; the seaward half very shallow, with a sandy bottom, the landward half deep. It is evidently merely a blocked inlet of the sea. To the south a lofty ridge intervenes, and then follow low marshy or sandy tracts, with rocky eminences sticking up out of them, evidently once islands. Then we reach the more extensive lowland in which the village of Ogne stands. This tract bears all the evidence of being a dry inlet; for example, not very far from its head, *i.e.* about 2 miles inland from the sea, there is a sandy beach. This inlet was doubtless in part filled up by the Ogne river, which comes down heavily charged with sediment when in flood, and peat-stained from the upland marshes. The river, in fact, seems in part to have filled up its own channel, for at one point it does not flow across the plain, but winds round between what must have been the shore of the old inlet and an island close off it.

Present appearances seem to show that we have the two lakes Bruvand and Helgevand, and in the Ogne plain, but especially in the first and third, an interesting study of the same physical process at different points. In the case of Bruvand, leaving out of account the accidental seaward lagoon, we have a small fjord, now partly dry, but occupied at its upper and, as usual, its deeper end by a lake, which also, as has been said, is deep at its head, but very shallow at its lower end, and, as a whole, pretty certainly filling up. Now the Ogne river, debouching into what may be called the old Ogne fjord, is a much larger stream than that which feeds Bruvand, and would have already filled up the lake which appears to have existed at the head of this old fjord also. The sandy coastal tract bordering Ogne bay merges landward into a flat, fertile alluvial tract, such as may some day occupy the present position of Bruvand. The case of Helgevand is probably similar to the old fjords of Bru and Ogne between which it lies, though it is a bolder, rockier, and more irregular lake than Bruvand; it is formed of two main arms lying at an acute angle, the upper being the deeper, while a third arm now forms really a separate lake, being separated from the others at their point of junction by a reed-choked shallow over which there are stepping-stones. This therefore would have been a narrow, ramifying fjord, whereas those of Bru and Ogne would have been wide and open. Moreover, it may be observed that the stranded islands already described would have lain mainly off the mouth of the old Helge fjord, whereas the mouths of Ogne and Bru fjords would have been open as the wide-mouthed fjords of Norway generally are. It seems that one can distinguish these two types of fjord in Norway; we may contrast the very deep type, with its narrow, island-guarded mouth, such as the great Nord fjord, and Sogne and Hardanger fjords, and the numerous lesser western fjords, against the open-mouthed shallow fjords, such as Christiania, or those east of the North Cape, which have no islands outside, but may have some within. Perhaps Trondhjem fjord is transitional between the two types.

But the river is not the only cause of the drying of the Ogne inlet. At many points on the Norwegian coast, old shore-lines and similar phenomena give evidence that the land is rising, or has risen, and the fact is particularly clearly illustrated in Jaederen about Ogne. Here we have the main reason for the stranded islands along the shore, and the absence of islands off the coast, and also in great measure, no doubt, for the low boggy foreland to the north. Moreover, one can read the evidence of two movements, not only of the rising, but of a previous sinking. The heavily glaciated rocks run right down into the sea.

The varied character of the different parts of Jaederen naturally has a striking influence on the distribution of population. Except for a very few small valley farms, the rocky country is uninhabited, whereas the low coastal district immediately to the north must be one of the most thickly inhabited tracts in Norway: unattractive as it is, it is dotted with farms and villages. It must always have been so; the district has yielded a large number of early traces of habitation; and it is a fact worth noticing that about the twelfth century there were at least three churches on this short strip of coast, and they were founded from England. Ogne was one of them; the present building retains the west wall of the old, and has in it an Early English doorway, and other remains of the same period have been discovered.

REVIEWS.

EUROPE.'

LIVERPOOL.

'History of Liverpool.' By Ramsay Muir. Published for the University Press of Liverpool by Williams & Norgate. 1907.

MR. RAMSAY MUIR has approached his subject in the right spirit. When dealing with a city so great and so modern as Liverpool, one is inclined to be a little contemptuous of its shadowy beginnings. In 1565, after some five hundred years of existence, the population was only seven hundred. There seems to be little connection and no real historical relation between this mediæval village and the great city as we know it to-day. Most people would content themselves with attributing the rise of modern Liverpool to its splendid geographical position in the exact centre of the British Isles. But Mr. Ramsay Muir has done well to devote the first hundred pages of his book to the mediæval period, and he emphasizes adequately Liverpool's ceaseless resistance to the feudal lords, to the king, and to the extravagant claims of Chester. These events, slight as they appear in comparison with those of modern times, are not only of antiquarian interest; they are vital to the understanding of the town's later vigour. It is, indeed, no extravagance of thought to trace step by step the development of Liverpool from the first mention of the place in Domesday Book to the year 1229, when the town acquired self-government—from 1393, the period of its greatest success in early times, to the age when her trading ships plied ceaselessly across the Atlantic.

Liverpool begins humbly as one of the unnamed half-dozen small clearings called berewicks, which the Domesday commissioners did not even think it worth their while to name. A small tidal creek "entered the Lancashire shore from the estuary, and, running inland in a north-easterly direction for nearly half a mile, enclosed a small triangular peninsula, a low ridge of ground, rising gently from the north until it reached its highest point (some 50 feet above sea-level) at the southern point or apex of the triangle, overlooking the entrance of the creek." This creek was the Liverpool pool, which until the eighteenth century (when the earliest dock was made out of its mouth) formed the dominant feature of Liverpool geography, and was probably the cause of the creation of a little town here. The Pool left the river where the custom-house now stands, and its course is marked by the line of Paradise Street, Whitechapel, and the Old Haymarket. To the south and east of it, where Lime Street, Church Street, Bold Street are to-day, the grounds lay waste as far as the boundary of the neighbouring township of Toxteth, marked by the line of Parliament Street. To the north and west of the Pool lay

the handful of mud hovels which formed the berewick of Liverpool. They probably lay somewhere about the site of the Town Hall. Mr. Muir goes on to trace the earliest geographical features, identifying them with modern streets or buildings, and giving us in this way a most excellent picture of beginnings.

He then goes on in a few brief sentences to discuss the manorial government of the settlers here located, calling them serfs, and pointing out their lowly position in an unnecessarily and not quite scientifically exact language. Things went on in this way until 1207, when King John, who did so badly for the country at large, turned the obscure hamlet into a borough, and endowed it with burghal privileges. One would like to know whether it was the king's enlightened view of the possible development of Liverpool, or the lord, or the manorial tenants who thus took the first step in the recognition of future greatness. Mr. Muir suggests that it was John's conquest of Ireland which led to his action at Liverpool, but we think there was something more than this, for the designs of laying out the new borough were definite and complete, and were obviously the result of care and thought. It was at once constituted a free port. Mr. Muir shows in an exceedingly useful way that its development as a port was dependent upon two factors—first, the close environment of an extensive industrial centre; and, secondly, the natural facilities for harbourage and protection to shipping. It is a mistake to suppose that the latter is the only factor needed in a port. Until the first was secured, Liverpool was in a very poor way. It was only when both were secured that she became great. This lesson is important in many ways at the present moment, for Southampton and Dover are repeating the same experience, and we witness how great natural advantages are counterbalanced by economic disabilities.

But commerce alone does not promise a very inspiring memory. The citizen who, in contemplating the history of Liverpool, can boast of nothing but the great increase of population and the colossal heaping up of wealth, has no sympathy with a higher ideal, and can be no sharer in the new line of development which his city has taken. The fame of Athens rests higher than that of Carthage, and Liverpool herself recognizes the fact. The city which at the present moment is engaged in erecting a great cathedral and a great university is no mere aggregation of uncultured employers and discontented employees. A new era has dawned. In 1882—after much opposition—the university college was opened in a disused lunatic asylum in the midst of a slum district. Now, by the cordial support of the city and the most generous private endowments, this insignificant beginning has grown into a fully organized and independent university, and has taken its place amongst the great seats of learning of the world. No surer sign of the new century is visible in England; no greater evidence—if any is needed—that Liverpool is abreast of the times.

A university, however, is not a wholesale remedy for all sorts and conditions of evils; and Liverpool, like all great cities of to-day, must spend an incalculable amount of energy and money in tackling the abuses which prevail within her jurisdiction. Mr. Muir emphasizes the evils especially characteristic of Liverpool, and says enough of such matters to show that, however busy the city of Liverpool has been in the past, she has greater and more difficult tasks yet to undertake.

Mr. Muir describes and illustrates several of the most important topographical features, namely, Liverpool Tower; the old Custom-house; Liverpool in the Seventeenth Century; Liverpool, from Duke Street; London Road and the Gallows Mills; the Old Dock and Custom-house; the Old Fort on the North Shore; Lord Street—all of these are W. G. Herdman's drawings, which were based on earlier material of the eighteenth century. The most interesting of the others are Liverpool Castle ("an attempt to recover the plans of the Castle of Liverpool," by the

late Edward W. Cox); the Tower and Old St. Nicholas (c. 1750); Shaw's Brow and St. George's Hall (1849); the conjectural map of Liverpool in the fourteenth century; map of Toxteth Park (1769); and the map of Liverpool in 1725. These illustrations, drawn from original sources, are additions of considerable value to the book.

Altogether Mr. Muir travels over his ground most admirably. His care for detail does not mislead him in the grasp of great essentials, and we read through his chapters with considerable interest. They deal with the Berewick of Liverpool, 1066–1207; the Foundation of the Borough, 1207–1229; the Baronial Lords of Liverpool and the Building of the Castle, 1229–1399; the Life of Liverpool during the Middle Ages; the Anarchy of the Fifteenth Century; the Age of the Tudors, 1485–1603; Trade and Society in Tudor Liverpool; the Beginnings of a New Growth, 1603–1642; the Three Sieges, 1642–1660; the Beginnings of Modern Liverpool, 1660–1700; Rising Prosperity, 1700–1756; the Slave Trade, 1709–1807; the Age of Wars and Privateering, 1756–1815; Inventions and Commercial Advance, 1760–1835; Civilization in Liverpool, 1760–1835; and the Nineteenth Century, 1835–1907. There is a fairly good index, and a useful note on the authorities used.

L. G.

THE SHORES OF THE ENGLISH CHANNEL.

'Les Falaises de la Manche.' By Jules Girard. Paris: E. Leroux. 1907.

M. Girard describes the shores of the south side of the English Channel in a very interesting way, without too much of topographical detail, but constantly keeping in mind the processes of coast erosion which they exemplify. Perhaps the author is at his best when treating of the noble chalk cliffs, which are so conspicuous features of this coast. He analyzes their characters, pointing out how the structure and composition of chalk, together with the action of tides, storms, shore currents, winds, and weathering generally, explain the varied scenery. Beautiful illustrations from actual photographs are given, and are in themselves a rich set of object-lessons. To English readers the work also is of value as a guide to the development and history of our own shores; those familiar with the white cliffs of Albion will have no difficulty in recalling instances which correspond exactly to those adduced from the French coast. A long chapter is devoted to the loss and gain of land by the operations of the sea—a question which is at present engaging the attention of a royal commission in England—and it is pointed out that so long as the sea-level remains constant, as it seems to have been for a considerable time, the loss at one place about equals the gains at another. The rapid obliteration of old harbours and the difficulty with which many of the modern ones are kept open are also the subject of some interesting remarks.

J. S. F.

ASIA.

MOAB.

'Arabia Petræa. I. Moab.' By Alois Musil. *Illustrated.* Pp. xxiii. and 448. Vienna: A. Hölder (for the Vienna Academy of Sciences). 1907.

The appearance of yet another work claiming to give an exhaustive description of Arabia Petræa can only occasion regretful surprise. Why, one inevitably asks, was not the author's material embodied in the great work of Brunnow and Domaszewski, which was published long after Dr. Musil's journeys were ended? Why, if that were impossible, does the latter's book appear now, as if 'Die Provincia Arabia' did not exist? There is a reference to Brunnow and Domaszewski's work in Dr. Musil's preface, but no account is taken of it in his text. Nothing

is omitted, because it has been described already in 'Die Provincia Arabia;' nothing is shortened, and very little is added. To all intents and purposes, Dr. Musil aims at doubling the earlier book. His preface reveals the fact that the more reasonable and useful course had, indeed, been suggested to him, and that he was at one time in negotiation with Dr. Brunnow; but the negotiation was broken off, it is not said why. If individual or national *amour propre* influenced the decision, it is much to be regretted for everybody's sake.

Dr. Musil went to the Holy Land as a theological student in 1895, and travelled beyond Jordan for the first time in the following year. Between that date and 1902 he wandered widely in southern Syria, exploring chiefly the districts of Petra, the Hauran, Moab, and Ammon, but going as far afield as Tadmor on the east, and Jebel Ansariyeh on the north. He acquired a thorough knowledge of Arabic, and learned the ways of the trans-Jordanic tribes, and thus was enabled, in 1898, to discover the interesting paintings of Kuṣejr 'Amra, which he has published in a separate volume. Gradually increasing his surveying-plant, he succeeded in the end in making a new map of Arabia Patræa, in which many of the blanks of the Palestine Survey are filled up.

The present volume is mainly a record of routes, with views (usually very good) and brief descriptions of the main wayside features. The interest is chiefly antiquarian, as is inevitably the case with almost all books on the trans-Jordan country; and it is rather to ancient than to modern geography that the author contributes. His map, however, is a very careful and welcome piece of cartographical work. Dr. Musil is a firstrate explorer, thoroughly qualified by preliminary training, indefatigable and accurate in the field; and no survey made by him would be superfluous. Our only regret is that there should be two books on one region, largely repeating one another, made out of material which, thrown into one melting-pot, had made a greater book than either.

Sinai.

'Die Halbinsel der Sinai in ihrer Bedeutung,' etc. By Prof. Dr. E. Dagobert Schoenfeld. *Map and Illustrations.* Pp. viii. and 196. Berlin: Dietrich Reimer. 1907. *Price* 8 *marks.*

This book is based on a journey made in 1903 from Egypt to the Catherine monastery in Sinai, and thence northwards by Nakhle to Hebron in Palestine. The author, Dr. Dagobert Schoenfeld, had had previous experience of Arab travel both in Barbary and in the northern Sudan. The object of his book is mainly to support traditional and pre-critical views of the Israelite wandering. The first part of his journey led the author over beaten tracks, the second part through a region of little interest. The whole did not show him enough of the peninsula to enable him to make any notable addition to our knowledge of it. How far he rehabilitates old identifications of the stations in the Wandering we must leave to others to decide. The style has a tendency to inflation, and the author's interest lies too much in trivialities and personal matters.

India.

'The Imperial Gazetteer of India: The Indian Empire.' Vols. 1, 3, and 4. Clarendon Press. 1907. *Price* 6*s. net. each vol.*

It is doubtful whether any work descriptive of a single country, in the political sense, has ever been conceived and carried out on the scale of the Gazetteer of India, the general scheme of which was devised and set in operation by the late Sir William Hunter nearly forty years ago. It may be added that no country needs a work of reference of this sort more than India, which contains, probably, the maximum of variety, both ethnical and physical. The foundation of the whole undertaking is a

very complete account of each District, and, as far as information is available, of each State. In some cases this was prepared by an experienced local official for each unit independently, on the lines set forth in the general scheme; elsewhere, the collection of materials and their subsequent compilation were entrusted to a single editor for the whole province. For current use in India itself, it is this part of the work which is of the most practical importance, and many an official, posted to a part of the country with the geography, products, population, and languages of which he is unfamiliar, has been deeply grateful for the knowledge thus imparted, and also, perhaps, for many a pleasant hour of solitary camp-life, spent in the perusal of volumes both interesting and often of high literary and scientific value. The topographical and historical cream of this Provincial series was then skimmed off into the Imperial compilation, with the addition of the general sketches contributed by the accomplished editor himself. The first edition of the latter series, in nine volumes, was issued in 1881, followed, six years afterwards, by one in fourteen volumes. Much has been learnt and much has happened in the last twenty years, so it is not to be wondered at if that number has now grown to twenty-six.

To readers in this country, the Gazetteer is chiefly known through the general summary entitled "The Indian Empire," which Sir William Hunter was happily inspired to publish separately in 1893, and which, though deprived by its bulk of the claim to be considered a handbook, has ever since its publication been the *vade mecum* of the cold-weather tourist, and the popular source of information about India amongst inquirers at home. The work under review is the expansion of this volume of 850 pages into four, of between 500 and 600 pages each. Those already published are respectively entitled Descriptive, Economic, and Administrative. The second volume, dealing with the History, is not yet out, and the editor, Mr. J. S. Cotton, observes in his general Preface, that, whilst the rest of the work has been completely rearranged and rewritten, the portion relating to the history of the British connection with India, into which his predecessor, as is well known, threw some of his very best work, will be reproduced almost untouched. The great expansion of the treatment of the different subjects has led to the substitution of signed monographs by specialists for the concise summaries by the editor, which formed the earlier work. This plan has its merits, in that the statements made go forth with all the weight of recognized experience, and, at the same time, since no single individual "knows India" in its widest sense, the colouring imparted by extensive provincial knowledge, or by strong personal views upon subjects not altogether beyond controversy, can be duly discounted, if it chance to have intruded into the narrative. It is not to be inferred from this last remark that the bias in question is other than exceptional, merely that it is not entirely absent from the text. It is possibly to the relegation of the subjects to different hands that may be ascribed the difference in the dates up to which the statistical information is incorporated; but the editorial portion of the respective chapters generally quotes more recent figures, and the whole may be considered up to date, as is only to be expected from a highly efficient, albeit—according to Mr. Morley—a somewhat "soulless" bureaucracy.

The wide field included under the heads of Economics and Administration scarcely come within the scope of this review. Just now, however, it is worth while to call attention to the accounts herein given of the place occupied by the village organization in the life of the Indian masses, and, again, to that of the position and responsibilities of the Collector or head official of the district. In the remarkable detachment of the former from the general currents of political development, and in the embodiment in the latter of the personal authority upon which British influence has hitherto rested, are found keynotes which are too liable to

become inaudible amidst the hum of the modern city and the scarcely less continuous outpourings of legislative Councils and the like. In the first or descriptive volume will be found the matter most germane to the interests of this *Journal*. Mr. Cotton should, in the first place, be congratulated upon the excellent map he has secured from Mr. Bartholomew, which is up to date, clearly printed, and not overcrowded with place-names. The geographical part of the Gazetteer, with which the work opens, is from the hand of Sir T. H. Holdich, and is derived mainly from his larger work on the subject, which was reviewed in this *Journal* in 1905. It is unnecessary, therefore, to say that the treatment is adequate throughout. He does not limit the title India, it may be noted, to the territory south of the Himalaya, but applies it to the mountains and plains to the north, east, and west of that system, making it co-extensive, in fact, with the sphere of British influence in that portion of Asia. In so doing he is undoubtedly right, as, in addition to the political considerations involved, modern geology and meteorology both point to this expansion as denoting the true barrier between India and the rest of Asia.

The chapters on these two subjects are written by Mr. Holland and Sir John Eliot respectively. India, says the geologist, is emphatically the land of paradox, from the point of view of his special branch of science, and in the description here given, the author does his best to correlate the features of the two main divisions of the country with the equivalent stages in the European standard scale. In the course of this attempt he introduces a series of group-names, which appear from a footnote to have been adopted by the consensus of Indian geologists. It is open to question, however, whether terms primarily belonging to philology, such as Dravidian and Aryan, are quite appropriate to geological phenomena, especially as in the tract known linguistically, and in a secondary sense ethnically, as Dravidian, there is said to be no trace of the fossiliferous strata for which this name is proposed by the geologists. Nor, again, is the chronological sequence implied by the application of the term Aryan to the later formations, from Cuddalore and Burma to the Himalaya and Baluchistan, easily recognizable. Puráṇa, it is true, colloquially connotes age in the present day, but the term is already allocated to literature of a date far more modern than that generally known as Aryan. How much of India is peninsular and how much continental seems to be an open question. In the geological as in the geographical chapter, all south of the Himalaya is accounted peninsular. Meteorologically, however, that term applies only to the portion south of the Vindhya, and this subdivision seems to be supported by ethnography and history, which, allowing for the usual belt of intermediate conditions, point to the differentiation of Gangetic or Continental India from the well-defined triangle tapering southwards from it. The sixty-five pages on botany, by Sir J. D. Hooker, are a welcome substitute for the couple of pages to which the subject was restricted in the earlier edition, and the same may be said of the chapter on Zoology by the late Dr. Blanford, which shows a similar advance upon its predecessor. The Population is dealt with by Mr. Gait, probably the best authority in India, with all the experience of two Censuses to guide him. Dr. Grierson, who writes the account of the Languages, is the head of the Linguistic Survey, but might more correctly be described as the survey itself, for the greater part of the work is his. Religions, too, are as comprehensively treated by Mr. Crooke as can be done within the space of about forty pages. The value of the work, as a whole, has been incalculably enhanced by this more liberal treatment of its principal subjects, and far more exacting personages than the "ordinary reader" will find that they need not go beyond it for all the information they are likely to require about the Indian Empire.

J. A. B.

AMERICA.

Ethnology of British Columbia.

'The Native Races of the British Empire. British North America. I. The Far West, the Home of the Salish and Déné.' By C. Hill-Tout. London: Constable. 1907. Pp. xiv., 263. Size 9×5 inches. *Price* 6*s*.

The task of describing the Salish and Déné tribes of British North America could not have been entrusted to safer hands than those of Mr. Hill-Tout, who lives in British Columbia, and for a long time has spent a part of every year among the Indians of the country. His work is already well known to anthropologists, his linguistic studies being particularly valuable. Knowing the people so well, Mr. Hill-Tout, in the book under notice, has succeeded in giving, without going into too great detail, a most readable and at the same time valuable account of the manners, customs, and physical characters of the Salish and Déné peoples. The physical character of the natives is particularly interesting, as, while some of the Indians are of the regular North American cast of countenance, others approximate to a Mongolian type. Generally it is the coastal group which is more distinctly Mongoloid, and this perhaps is only what would be expected. Mr. Hill-Tout is particularly good in his chapters on technology and social customs, but where all is good it is difficult to pick out any part for especial praise. The net result is an admirable and sympathetic account of a most interesting people.

The illustrations are excellent, but it is a pity that the publishers could not have seen their way to give a better map. In a book dealing with two only of the Indian peoples, and those two among the most westerly, it is unnecessary that the map should show the position of all the linguistic stocks of British North America. A map of Western Canada, which could have been produced on a larger scale, would have been far more useful. It is also unfortunate that the titles on the cover are not the same as that on the title-page. To call the book 'British North America' on the back, and 'North America' on the side, both titles being insufficient, is not only inconsistent, but misleading.

Peru.

'The Andes and the Amazon. Life and Travels in Peru.' By C. Reginald Enock, F.R.G.S. London: Fisher Unwin. 1907. Pp. 370. *Maps and Illustrations. Price* 21*s. net.*

The author of this work is a young mining engineer who has travelled over various parts of Peru to report upon the mineral products in several mining centres. Mr. Enock is an accomplished traveller, an excellent observer, a daring explorer, and one who, while noticing the physical aspects of the regions through which he travels, is also alive to the halo of romance that covers and surrounds them. A traveller without imagination loses more than half the pleasure and interest of his journeys. But with that gift Mr. Enock is richly endowed, and to it we are indebted for his picturesque descriptions of scenery, and for the reflections arising from a contemplation of the magnificent works of nature with which he was surrounded.

The author appears to have resided longest in the very interesting Andean valley known as the Callejon de Huaylas, whence he undertook excursions into the valley of the Marañon. He also made a gallant attempt to ascend the lofty peak of Huascaran. The chapters describing these journeys are the best in the book; but there are others which will be valuable to future travellers, especially if they are connected with mining investigations. There are chapters which give details

respecting the mineral wealth of Peru, and useful hints on equipment and arrangements for journeys in the Andes.

The accounts of Incarial ruins actually visited by the author are exceedingly interesting. Chavin, as Mr. Enock truly remarks, calls for closer and more detailed examination. He gives a photograph of the very intricately carved stone of Chavin, now at Lima, upon which much has already been written, and which forms an important link in a chain of evidence. The original plate illustrates the learned paper on the stone of Chavin by Don Jose Toribio Bolo (Lima, 1900). The author's visit to the ruins of Huanuco has resulted in one of the best existing accounts of those remarkable edifices. The ruins, with the remains of columns, at Incahuasi have already been fully described.

Mr. Enock appears to have made three other expeditions—one along the coast north of Mollendo, visiting the valleys of Camana and Ocoña; another to the famous quicksilver-mines of Huancavelica; and a third to see the gold-mines of Aporoma and Poto. In his coast journeys he gives a good description of the desert *medanos*, though he cannot be complimented on the illustration. His descriptions of the *llocllas* or fan-shaped deposits at the openings of mountain gorges, and of the appearance of an authelion, deserve attention. The journeys to Huancavelica and Caravaya appear to have been very hurried, and his more detailed reports of the mines of those regions are presumably confidential.

It is pleasant to read Mr. Enock's kindly and generous appreciation of the good qualities of the Peruvian Indians. He has a favourable word for their industry as agriculturalists, as well as for their skill in the production of textile fabrics and cleverly designed pottery. Of a poetical and imaginative habit of thought, the Indians are fond of music and of singing their love ditties and *yaravies*. They have good qualities, as Mr. Enock testifies, and are hospitable and faithful when their confidence is once gained.

A great part of this portly volume is occupied with extracts from works on Inca civilization, on the Amazonian Indians, and other subjects with which the author is not personally acquainted; and it was, we think, a mistake to derive all his information respecting the Incas from an author of the eighteenth century, instead of going to the original authorities, which are now easily accessible both in Spanish and English. But for the chapters containing Mr. Enock's personal observations and his own experiences we have nothing but praise.

The map which accompanies Mr. Enock's book is inaccurate, especially as regards the course of the river Paucartambo, yet no doubt it is based on the latest available information. This is one more proof of the urgent need there is for the preparation of an authoritative map of the eastern slopes of the Peruvian Andes.

GENERAL.

Life of Captain Cook.

'Captain James Cook, R.N., F.R.S., "The Circumnavigator."' By Arthur Kitson. London: Murray. 1907. *Maps and Illustrations. Price* 15*s. net.*

The appearance, in this volume, of a connected narrative of the life of the greatest English navigator is to be heartily welcomed. Strange as it may appear, in view of the copious literature on the subject, such an account, based on the most trustworthy first-hand documents, has never before existed, most writers having been content to copy the often inaccurate 'Life,' by Kippis, or the narratives by Hawkesworth and Douglas, which, as is well known, were interlarded—especially the former—with the personal opinions and reflections of those editors. Mr. Kitson has applied himself to all the available original sources, including

the Admiralty papers preserved at the Record Office, and by a judicious use of published material as well, has for the first time placed in a true light the whole career of the navigator, so far as data exist for the portrayal. The amount of careful labour expended on the work must have been very great, and the author has evidently spared no pains to make the result as complete and accurate as possible. He has been able to correct in many particulars the somewhat imaginative accounts of previous writers, especially with regard to the earlier part of his hero's career. As regards the three voyages on which the navigator's title to fame must mainly rest, the actual corrections in matters of fact are not, perhaps, so numerous, or at least not so obvious, and a detailed comparison with previous narratives would be necessary to bring many of them to light. In this part of the book the author confines himself mainly to a straightforward narrative of events, and restricts the work of commentator within somewhat narrow limits. But this is a fault—if such it be—on the right side, and we at least escape the distraction of unnecessary breaks in the story.

With regard to Cook's ancestry, Mr. Kitson is inclined to think that he was of Scottish extraction, and he considers that his father must have been possessed of more education than has generally been supposed. He follows Dr. Young—the best authority for Cook's early life—in holding that the latter was never bound apprentice to Mr. Saunderson of Staithes, but that there was merely a verbal agreement without indentures. The story of the shilling stolen from his employer's till, and the running away to sea as a consequence, is shown to be quite unjust to Cook's memory, the matter having been cleared up to the satisfaction of his master, who freely abetted the boy in his aspirations after a sailor's life. Cook's entry into the Royal Navy, after his period of service with the Walkers, was, Mr. Kitson thinks, quite a voluntary act, and not the result of fear of the press-gang.

The papers in the Record Office permit us to follow with complete certainty his movements from one ship to another during the stirring times of the war with France, particularly in the operations resulting in the conquest of Canada. In the short space of two years he rose to the rank of master, the first ship to which he was appointed in this capacity (1757) being the *Solebay*, not the *Mercury*, as is usually stated. The mistake arose from the fact that there was a second James Cook in the service at this time. We do not learn much of Cook's personal work, but it is evident that he was actively and usefully employed, though the story that he piloted the troops to the landing beneath the heights of Abraham must, it seems, be given up. With the conclusion of peace came the important surveys on the coasts of Canada and Newfoundland, and the details given throw into clear relief the whole-hearted devotion to his work which distinguished the navigator throughout his whole career.

The story of the three great voyages is told in a clear and easy style, frequent extracts from the explorer's own journals helping to bring his personality vividly before the reader. His private correspondence with the Walkers and others is drawn upon for the elucidation of certain points, while quotations from contemporary writers or official documents help to throw light on various circumstances connected with the preparations for the voyages and the estimation in which the commander was held at the time. As an instance of Mr. Kitson's thoroughness, we may mention that after quoting from Dr. Burney's 'Memoirs' a statement that Cook had marked his own route in pencil on his (Dr. Burney's) copy of Bougainville's map, he is able to inform us that the pencil-marks on the chart (now in the British Museum) are as distinct as when they were first made. Due prominence is given to Cook's services towards the stamping out of scurvy, while the extracts relating to the organization of the third voyage, and the circumstances

under which Cook was led to sacrifice his well-earned rest by volunteering for the command, are of particular interest. The account of the tragic end to his career does not seem to add anything to our previous knowledge, though it is useful to have the most authoritative version placed on record, when so many conflicting statements are current. It is in regard to the geographical aspects of the voyages that a somewhat fuller commentary might have been acceptable. Little attempt is made to discuss the position of geographical knowledge at the opening of Cook's career of discovery, or to sum up the total additions to such knowledge which resulted from it. While touching on the search for Bouvet island, we might have expected the author to refer to its eventual discovery, only a few years ago, by the *Valdivia*. He does not seem aware of the existence of the club, once in the possession of Sir J. Banks, by which Cook is said to have met his death, nor of the monument lately erected to his memory by a French admirer at Méréville. Elsewhere he shows himself fully informed on subjects of recent discussion. Thus he successfully defends Cook's claim to priority on the east coast of Australia against Cardinal Moran's fantastic theory of its discovery by Quiros. And it would be ungracious to dwell upon possible omissions, which are certainly few and unimportant, while, taken as a whole, the author has done a most creditable piece of work, for which he deserves the gratitude of all students of geographical discovery.

The illustrations are well chosen, and consist almost entirely of photographic reproductions of contemporary documents, portraits, and drawings. The two portraits of Cook are those preserved in Greenwich Hospital and in the Whitby Museum, the former by N. Dance.

A Pocket-book for Travellers.

'Scouting and Reconnaissance in Savage Countries.' By Captain C. H. Stigand, F.R.G.S., F.Z.S. London: Hugh Rees, Ltd. 1907. *Price 5s. net.*

Under the above title, Captain C. H. Stigand has produced a little handbook, which gives a great deal of information of a very practical nature in connection with matters that cannot fail to be of importance, not only to the scout in a hostile country, but to all pioneers and explorers. To begin with, there are useful hints on finding the time and direction by means of rough bearings of the sun, stars, and moon, which, though not pretending to scientific accuracy, should be of assistance to any traveller unprovided with instruments who may be hurrying through a wild country. This is followed by a chapter on "Landmarks and General Information," another on "Tracking," which contains many good tips for following up and recognizing the spoor of various animals and men. After this follows a chapter of "General Hints," one on "Tribal Customs and Differences," followed by one on "Reconnoitring Hostile Kraals or Villages." There are also two appendices, the first of which gives instructions for using the star maps which are placed in pockets at the beginning and end of the book, while the second suggest various "Exercises for Scouts," to assist in observing and noting events, and facts that may prove of importance later on. Among the books consulted, Captain Stigand specially mentions the Society's 'Hints to Travellers,' and for more exact information on all the astronomical matters dealt with this should be referred to.

The little work is strongly bound in pocket-book form, and at the end contains blank pages for notes and for keeping a rough field book.

SHORT NOTICES.

Asia.—'Wanderings East of Suez.' By Frederic C. Penfield. (London: George Bell. 1907. Pp. xvii., 349. *Illustrations.* 10s. 6*d. net.*) In part this book partakes of the character of those written by "wanderers" with no particular purpose, save

that of superficial observation. In common with such works, it has the familiar "catch" headlines to its chapters; among these "The World's Turnstile at Suez" deserves notice, as it gives a clue to the author's deeper purpose, that of commercial interest. His notes upon Asiatic trade in various aspects are the valuable features of the book.

'The Chinese Language and how to learn it.' By Sir Walter Hillier. (London: Kegan Paul. 1907. Pp. vi., 263. 12*s.* 6*d. net.*) This is a handsome volume of its kind, giving evidence of very careful production. The explanatory chapters on the written and the spoken language of China are clearly intelligible, even to those who approach the subject without knowledge.

America.—'Sunshine and Sport in Florida and the West Indies.' By F. G. Afialo. (London: T. Werner Laurie. 1907. *Illustrations.* 16*s. net.*) Plenty of pleasant description of travel, not only in Florida and the West Indies, but also elsewhere, as in Panama at the canal works, and in Colombia; plenty of scientific advice and narrative in the matter of tarpon fishing and other sport, including notes as to the geographical distribution of the tarpon; plenty of beautiful illustrations—these features go to the making of an entertaining volume, such as should be expected from its author.

General.—'Bradshaw's Through Routes to the Chief Cities of the World.' (London: Blacklock. 1907. Pp. xlviii., 656. *Maps.* 5*s. net.*) This well-established guide now reaches its fifty-first anniversary. Though its indications of great main routes are thoroughly worked out and carefully selected, it may be felt that the brief notes which bring the book into competition with the ordinary guide-books are a less satisfactory and essential feature. As regards the United Kingdom, "a supplement has been introduced dealing succinctly with the chief watering-places and health resorts of the British Isles." It is not a little surprising to learn that Oxford ranks among these; on the other hand, any attempt to reckon up the omissions from the list, or to imagine the system on which it has been selected, makes it impossible to congratulate the editors on this new feature.

'Geography in Relation to War.' By Colonel E. S. May (London: Rees. 1907. Pp. 61. *Maps.* 2*s. net*). This small book consists of "two lectures on military geography delivered at the conference of officers of the General Staff at the Staff College, and to the members of the Royal Artillery Institution respectively." Each several point in which geographical knowledge or instinct is of value to the soldier is lucidly set forth, and illustrated where necessary with historical examples, which in a few cases are themselves clarified by sketch-maps.

THE CIVIL SERVICE EXAMINATIONS.

DURING the past month a step has been taken of incalculable indirect importance to the diffusion of geographical knowledge in this country. The Civil Service Commissioners have announced that after next year geography, treated scientifically, will be added to the list of subjects which may be taken up in the open competitive examinations for clerkships in the upper division of the civil service. This step must inevitably be followed, sooner or later, by the subject being made compulsory on candidates for several of the public departments.

It will be remembered that for years geography was one of the

subjects for candidates for the Foreign Office, which had its own special examination system, distinct from that for the remainder of the civil service. Last year notice was given that this special system was to be abolished, so as to bring the Foreign Office examinations, in their main features, into line with those of other departments. The change, however desirable in other ways, was a retrograde step as regards geography; but it furnished an excellent opportunity for bringing about a general advance in a more rational and practical direction. This movement, however, demanded preliminary action on the part of our older universities, for the Civil Service Commissioners naturally asked that they should take the lead in so important a matter; and in view of the careful consideration which these great institutions very properly give to any important changes, it is a matter of congratulation that our geographical campaign should have been brought to a successful issue within a year after it was opened. All who believe in the necessity of England rising to the level of Germany and the United States in the spreading of geographical knowledge, will be grateful to Oxford and Cambridge for the important part which they have played in this reform, as also to the *Times* and other organs of the press for the whole-hearted support they have given to it.

GEORGE TAUBMAN GOLDIE.

THE MONTHLY RECORD.

EUROPE.

Altitudinal Distribution in the Venetian Alps.—The study of altitudinal distribution, to which a new impetus has been given within recent years by the work of Ratzel, Bruckner, and others, is being taken up in various quarters.* In Italy the principal worker in this field is Prof. O. Marinelli, who has treated very fully of the various altitudinal limits in the Alpine district of Comelico in the first issue of the *Memorie Geografiche*, a new series of monographs intended as a supplement to the *Rivista Geografica Italiana* (Florence, 1907). The writer begins by a general discussion of methods, and lays stress on the need of modifying these to some extent according to the special phenomenon under investigation. Thus he differs from Ratzel in holding that, while in the case of physical factors such as snow and ice it may be desirable to lay down a "climatic" limit, in addition to the "orographic" limit actually existing in definite regions, such an abstraction cannot usefully be called into play in the case of anthropological distributions, in the determination of which so many special factors have to be considered. As regards the method of accumulating the data, for which some students have had recourse to existing official maps rather than to an examination of the ground, he points out that the Italian maps do not present the facts with sufficient precision to allow this to be done. Even observations made on the spot for the purposes of the research are frequently unsatisfactory, and Prof. Marinelli admits that much of his

* Dr. R. Sieger's suggestions respecting research in one special branch of the subject were the subject of a note in the November number (p. 537).

own previous work has lacked the desired precision. The limited district to which he has devoted much attention during the past two or three years—comprising the extreme upper basin of the Piave—is well fitted for such a study, as it forms on the whole a well-marked natural unit, though the administrative limits do not entirely coincide with the natural ones. Prof. Marinelli paid special attention to the distribution of population, and after dealing with this in a general manner, he discusses in turn the altitudinal limits of permanent habitation, and of the various forms of temporary settlements which here, as in other parts of the Alps, play so important a part in the life of the people, although in Venetia they do not show quite the same characters or importance as in the more western parts of the Italian Alps. The "stavoli," or chalets, are usually inhabited during the spring and autumn, though some are used during the summer also, and some do not serve as sleeping-places at all. As a result of observations in a number of different localities, the mean height to which they reach comes out as 1419 metres (4650 feet), or only 100 metres greater than that of the permanent habitations. "Fenile," or barns for the storage of hay (inhabited only during the hay-harvest), reach a mean altitude of 1686 metres (5530 feet); while the "casere," or communal cattle-stations, used only during the summer, extend higher still (1755 metres, or 5750 feet). The limits of the various forms of cultivation (which are closely related to that of the "stavoli") are also estimated, as also of trees and shrubs under various conditions, and of the glacier-fronts and permanent snowfields, though the observations do not permit a satisfactory determination of these. As regards exposure, a southerly aspect is particularly effectual in raising the limits in the case of human settlements, while a westerly seems generally preferred to an easterly one.

ASIA.

Physical Features of Sebu.—A series of papers on the physical geography of the Philippine islands, to be contributed by W. D. Smith to the *Philippine Journal of Science*, opens with an account of Sebu island (vol. 1, No. 10). The letterpress is illustrated by eight plates. Sebu is the oldest place of European settlement in the group, and, for its size, the most populous of the islands. The building of over 100 miles of broad-gauge railway, the possession of coal and oil, and the recent f eeing of its port, encourage Sebu to look forward to increasing prosperity. The core of the island is largely plutonic, overlaid by a conglomerate of varying thickness. Its backbone is formed by the Central Cordillera, running north and south, in line with the longer axis, and rising to over 3000 feet; partially wooded, and, save for scattered bands of ladrones, almost uninhabited; a region of very pronounced relief underlain by igneous rock, supporting a rather scanty flora, and eschewed by the natives. In isolated portions, thanks to a capping of coralline limestone, the range has an even crest, but elsewhere, as in the region of Mount Maupa, south-west of Sebu city, the outline is serrated. The main folding in the island having an east-to-west direction, its axis runs north and south, the same direction being exhibited by the streams in the vicinity of the Cordillera. This is, however, modified by a minor north and south folding. Between the cordillera and the coastal plains are the "intermediate uplands," their surface rock mostly limestone or marl. These uplands maintain a scantier population than might be expected, the natives in the centre living huddled in squalid barros. Corn, the principal crop, is indifferently cultivated. Sebu's best land is in the valleys of the Pandan, Jakupan, and other streams, broad and flat-bottomed valleys with floors about 150 feet above the sea. Nearly nine-tenths of the enormous population of Sebu crowds the exceedingly narrow and interrupted coastal plains, where, on a coral reef foundation, is deposited very varied *débris* from the hills, a rich compound

of diorite, andesite, basalt, sandstone, and limestone. The stiff paddy clay holding the water round the roots of the plant, rice here enjoys a most congenial habitat, and the coconut flourishes along the littoral. In the coves (*cuencas*) are the sugar *haciendas*, the great cornfields and vegetable gardens, but, from want of an impervious substratum, very little rice. The social and political trouble which has harassed the island is attributed to the crowding of a people of primitive civilization on the narrow margin of alluvial plains offered by the island.

AFRICA.

Hydrography of the Nile in 1906.—Continuing his invaluable researches on the hydrographical system of the Nile, Captain Lyons has issued (as *Survey Department Paper* No. 2, Cairo, 1907) a monograph on the 'Rains of the Nile Basin and the Nile Flood of 1906.' Before coming to the particular records for 1906, he discusses briefly the present position of the machinery for recording the data, and the normal distribution of the rainfall in time and space. The recent establishment of meteorological stations, both in the Sudan and in the equatorial regions, has placed the whole question on a much firmer basis, it being now possible to follow the course and intensity of the rains through the whole of East Africa from Nyasaland northward to the limits of the monsoon region near Dongola and Berber. It is from Abyssinia and the region to the south that further records of the rainfall are most needed, for when the heavy rainfall of July and August has set in, the conditions of the surrounding regions give but slight indications of the variations on the tableland, where a break lasting ten days may reduce the volume of the whole flood by ten per cent. The information received by telegraph from Addis Abbaba, and from Addis Ugri in Eritrea, was, however, of the utmost assistance for the forecast of the flood, while the number of lake and river gauges now working in the Nile basin are another most valuable aid. A qualified meteorologist was to be sent to Addis Abbaba during 1907, and it was also proposed to investigate the upper currents over the Sudan plains by means of kites, so that a still better knowledge of the factors in the development of the flood will be gained in course of time. After seven successive years of deficient flood, a flood of more nearly average volume was recorded in 1906. The low-stage supply of the spring months was greatly improved by heavy rainstorms in Abyssinia and the Southern Sudan during February and March (quite an unusual occurrence), and though the regular rains were rather late, and at first weak, matters improved so much in July, August, and September, that the flood could eventually be characterized as "fairly good." Captain Lyons illustrates the normal distribution of the rains throughout East Africa by a series of charts referring respectively to the three seasons in which most of the rain falls, and to the year as a whole. The first shows the distribution for the period March to May, corresponding to the first rainy season on the lake plateau; the second, the rainfall of June to September, being that which supplies the Nile flood, and is of primary importance to the Sudan; the third, that of October to December, the second rainy season of the lake plateau. The mean monthly rainfall is also given by means of tables for a large number of stations in or near the Nile basin. The bulk of the paper consists of a minute analysis of the rainfall and Nile-flood of 1906, and a discussion of certain special subjects, one being that of the low-stage supply of the Nile, which has been studied with much care by Mr. J. I. Craig. New light has been thrown on the seepage from the Nile into the Nubian sandstone, by which it seems clear that a very large quantity must be lost, though some is probably returned when the level of the water-table becomes higher than that of the river surface. It has also been shown that, owing to the rise of the Blue Nile, a large body of water is pounded back in the valley of the White Nile, and forms a

reserve which is drawn upon when the Blue Nile falls. The level may be temporarily raised by rainstorms during the months November to April, though these are of comparatively rare occurrence. A large number of diagrams are inserted, showing fluctuations of level as recorded by gauges, and other features.

Rainfall of the Atlas Lands.—The most complete study yet made of the precipitation conditions of North-West Africa (Morocco, Algeria, and Tunis) is that of Dr. Karl Knoch, which appears in the *Jahresbericht* of the Frankfurt Association for Geography and Statistics (17 Jahrgang, Frankfurt-am-Main, 1907). It occupies eighty-six pages, and embodies in a generalized form all the data on the subject at present available. For Algeria, and in a less degree for Tunis, they are fairly extensive, and some of the series of observations extend over a considerable number of years. For Morocco the case is different, though observations have been made at certain stations within recent years, while a general discussion of the climate in general had been supplied by Dr. Theobald Fischer, to whom Dr. Knoch owes the suggestion which led him to undertake the present work. After some preliminary matter, the author proceeds to discuss the distribution of the rainfall in space and time. The most striking fact is the great variation between different parts of the region. As regards the former, it may be said that, taken as a whole, the rainfall diminishes from the coast to the interior, and also from east to west, the most rainy region of all being that of the highlands of northern Tunis, though most of the Algerian Tell is well supplied. An exception to this general rule is formed by the Atlas of Morocco, where naturally the rainfall again shows a marked increase, after falling to a low figure over the outer plateau. Taken as a whole, the Atlas region falls within the realm of winter rainfall, with dry or almost dry summer, though this does not hold good beyond a limited distance from the coast. The summer drought is especially pronounced along the whole coast of Algeria and Tunis. On an average, the largest amount of rain falls in January in western Algeria, but, further east, in December. In Morocco the distribution seems to be somewhat different, so far as can be judged from the still scanty data. In the north there is a small amount of rain even in July and August—the driest months (the most rainy month being November), while further south they are quite rainless. In this direction the amount of winter rain also shows a relative diminution. In Mogador, *e.g.*, there is a subordinate maximum in March, besides the main maximum in December. With the increase in height as we go inland, the summer drought is moderated, while throughout the whole interior the spring is the most rainy season. A section of the paper deals with the water-supply of the rivers, which varies greatly in different parts of the region and at different times of the year. Most of the rivers reach a very low level during the summer drought, unless they are fed from the region of spring rainfall or from melting snows. Morocco, owing to the greater height of the Atlas towards the west, is more favourably placed than Algeria or Tunis in this respect. Another instructive section is devoted to a consideration of the relations of vegetation to rainfall, and this is further illustrated by a vegetation map on tracing-paper, which can be placed over the rainfall map. The fact that no regular cultivation is possible where the precipitation is less than 400 mm. (15·7 inches) is clearly brought out. A series of tables gives the rainfall statistics for a large number of stations, showing, *inter alia*, both the mean amounts and the percentages of the yearly total for each month and season.

The Development of Angola.—A consular report (Annual series, No. 3928) on the trade of Angola for 1906 takes stock of the present position and outlook of that Portuguese possession. Owing to the continuing depression following the heavy depreciation of coffee, its staple export, Angola, finding the littoral, to which ever since its foundation in 1575 it has been clinging, inadequate to supply its

wants, is now thrown on the resources, including immense rubber-producing areas, of its vast and still all-untapped hinterland. These neglected regions are in process of being opened up by three railways. The most important is the (British) Lobito-Katanga railway, whose objective is the Katanga mines, with their wealth of copper of superior quality. On completion, this railway will put Lobito port in communication with the Cape to Cairo railway, will connect with the Beira railway, and thus establish a trans-African line starting and terminating in Portuguese territory, securing also to Angola a share in the quickest mail route to British Central and South Africa. The line is to have a total length of about 1242 miles, and constructive works are in progress between its 37th and 53rd mile. Depopulation, however, cripples the progress of the railway, as also the Portuguese industries drained of many hands for the work of the railway. The Loanda-Ambaka line has now been extended to the 52nd mile beyond Ambaka, having still 37 miles to cover before reaching Malanje. Traffic is opened as far as Matette, 252 miles from Loanda, and is expected to be opened to Malange within a year. It is further proposed to extend the line 186 miles beyond Malange, so as to penetrate the Kwango basin, and the rich rubber-district of Lunda, and divert (it is hoped) the trade of the Kasai region from its outlet through the Congo Free State. A branch line northwards to San Salvador do Congo, to open up the Bembe copper-mines, and another from Kassalala to Dondo, are in contemplation. The Mossamedes-Chella railway has been surveyed to the 67th mile, and traffic is opened to Pedro Grande at the 42nd mile. The population of five of the six districts of Angola reached, in 1900, a total of 789,946, of whom 10,037 were white.

AMERICA.

Drift-ice in the Newfoundland Seas.—Dr. L. Mecking, whose paper on the ice-conditions in Baffin bay was lately referred to in the *Journal* (vol. **28**, p. 404), has since treated of the important and practical question of the distribution in time and space (particularly the former) of the drift-ice encountered in the much-frequented seas in the Newfoundland region (*Ann. der Hydrographie*, 1907, Nos. 8 and 9). He points out that the phenomena in question are only now beginning to be capable of scientific elucidation, owing to the almost entire absence of data until within quite recent years. Such data are now, however, accumulating, thanks principally to the monthly reports published by the German and American Hydrographical Offices, the latter of which are of most value for a study like the present. These, therefore, are used by Dr. Mecking as the ground work of his study, though it has been necessary to rearrange and co-ordinate the material in order to draw the desired conclusions from it. Some manipulation is necessary in order to show the results in a graphic form, while the reduction of the observations to a common scale for the whole period dealt with (1882–1900) has been effected by calculating the monthly amounts throughout in *percentages* of the yearly totals. Having summarized the data in suitable form, Dr. Mecking discusses briefly the relation of the ice-drift (both as regards pack-ice and icebergs) to the weather—a subject which he had already discussed in his previous study. The main result is to show a remarkable agreement between the ice-conditions of any given year and the distribution of pressure in the preceding year. Thus a steep gradient on the Labrador coast, with the off-land wind to which it gives rise, favours the southward movement of the pack-ice, while a similar steep gradient between Greenland and Baffin bay helps to bring out the newly formed icebergs from the shelter of the west coast of the former. The last and most important section of the paper discusses in detail the distribution, both of pack-ice and icebergs, within the year. It is shown that the curves for the two sorts of ice are quite distinct, for while the

pack-ice reaches a decided maximum in February, with a secondary maximum in May, the icebergs begin with a secondary maximum in March, the main maximum coming only in June. Many other interesting laws are brought out. Thus it is shown that the maximum in the case of pack-ice is developed *earlier* in a year of abundant ice than in one of scanty ice, whereas the contrary seems rather to hold in the case of icebergs. Other points discussed are the course and duration of the ice-season, the seasonal (as opposed to monthly) distribution of the ice, its distribution in space, and so forth. The comparative amounts of ice to the north and south of 45° are shown for each month, both by a table and diagrams, which bring out the fact that both kinds of ice are relatively most abundant to the south of that line in April, though the pack-ice shows a renewed southward extension in July. Dr. Mecking attempts in every case to explain the reason for the facts observed.

Orographical Nomenclature of the United States.—The United States Geographic Board has lately had under consideration the nomenclature of the major topographic features of the United States, about which no uniform usage has hitherto prevailed. In order to arrive at an authoritative decision as to the names to be applied and the exact limits of the features described by them, the board last year sent out questions to many American geographers and geologists, whose replies have been utilized for the solution of the questions. Decisions in regard to all the principal orographic features were announced in February last, being in almost every case based on a consensus of opinion on the part of those consulted. It does not appear whether the board have yet issued a report on the subject, but the decisions were communicated to the American Geographical Society at the time, and are printed in the Society's *Bulletin*, vol. **29**, No. 2. Only the more far-reaching decisions can be referred to here. The entire western mountain system of North America is to be known as the Cordilleras, while the name Rocky mountains is to include the ranges of Montana, Idaho, Wyoming, Colorado, New Mexico, and Western Texas, but not the Wasatch and Uinta ranges of Utah. "Pacific Ranges" is the name chosen for the Cascades, Sierra Nevada, and Coast ranges collectively. The two first are separated by the gap south of Lassen peak, the Sierra Nevada being thus curtailed by some 120 miles relatively to common usage. The Cascades extend northward into Canada, and the Coast ranges both northward into Canada and southward into Lower California. Nothing is said as to the northward limit of the Rocky mountains, though it is to be supposed that the extension of these into Canada is taken for granted. The Appalachian mountains are held to include all the eastern mountains of the United States from Alabama to Northern Maine. Decisions are also given with regard to the Plateau region, the Basin ranges (which include the Wasatch range, but stop short of the Blue mountains of Oregon in the north), and a limited number of separate orographic units.

Mexican Volcanoes.—The little-known volcanoes of Colima, Nevado de Toluca, and Valle de Santiago are described and illustrated by Prof. H. F. Cleland in the *Popular Science Monthly* (vol. 71, No. 2). The most recently active volcano in Mexico, Colima lies west of Mexico city, 50 miles from the Pacific. With a slope of from 35° to 39°, it forms a perfectly symmetrical cone, save for the protrusion, on its north-eastern slope, of a secondary cone. The twin cones rise respectively to 12,600 and 11,820 feet. The rim of the crater of the main cone is entire, except for a depression through which lava-streams flowed in 1885 and 1903. The crater has a diameter of little over half a mile. The chief barrier to the ascent of Colima on the north side is the lava-flow poured out by the secondary cone in 1869. Owing to the more rapid cooling of the outer edge than of the centre of the molten lava-stream, the flow on the north side, rising above that of the central portion, forms a kind of wall. The central

portion, remaining longer hot, continued flowing after the cone ceased pouring out lava, thereby lowering its surface. In August, 1869, a month after the principal eruption, the lava flowed a little more than 9 feet per day. The second cone, of a compact andesite, with a steep slope, presents no crater, but only three parallel fissures at the summit. In 1877, 1884, 1885, and 1903, minor eruptions occurred. The only evidences of activity since 1903 are copious steam and gases issuing from the fumeroles. Rising to 6000 feet above the plain, or 14,833 feet above the sea, the Nevado de Toluca is surrounded at some distance only by volcanoes, which form, through accumulation of ashes and lava, an almost enclosed basin. Of easy ascent, the crater can be reached on horseback in four to five hours. The first to reach the crater was Humboldt in 1803. It has not been in eruption since historic times, and still shows no signs of activity. The crater is a mile in its longest, a third of a mile in its shortest, diameter. The Valle de Santiago includes eleven craters, occupying an area roughly circular in outline. The diameter of the craters varies from 1500 feet to more than a mile. Four of them are occupied by lakes of pure water.

The "Stone-rivers" of the Falkland Islands.—The question of the origin of the well-known "stone-rivers" of the Falkland islands has recently been raised by more than one writer, *e.g.* by Dr. Gunnar Andersson, of the Swedish Antarctic Expedition (*Journal*, vol. **21**, p. 160), and Mr. Vallentin (*Ibid.*, vol. **25**, p. 96). This has suggested to a German student, Herr B. Stechele, to undertake a careful examination of the whole subject, and the results are published as one of the *Münchener Geogr. Studien*, edited by Dr. S. Günther (No. **20**, 1906). The writer describes the general physical characters of the group, as well as the stone-rivers in particular, and then examines in detail the various explanations of the phenomenon which have been put forward from the time of Pernety onwards. He groups the possible causes under the two main headings of endogenous and exogenous forces. It was the former which were called into play both by Pernety and, later, by Darwin, who ascribed the accumulations of rocks to volcanic or seismic action. But no satisfactory evidence pointing in this direction has ever been forthcoming, nor does it seem permissible to have recourse to geotectonic processes, such as fractures or dislocations of the crust, the group having been rather the theatre of extensive folding. We are therefore forced to fall back upon exogenous forces as supplying the true cause, though, in spite of the agreement in lithological character between the rocks of the "rivers" and the quartzite formations of the upper levels, the extremely slight inclination of the valley-slopes forbid us to suppose that they have been derived from these by any of the more ordinary processes of denudation and transportation. Nor can much be said in favour of glacial transport, observers being agreed in regarding a former extensive glaciation as extremely doubtful. Dr. Gunnar Andersson speaks in somewhat vague terms of the "rivers" as due to a peculiar mode of detritus transport, associated, as in some parts of the Arctic Regions at the present day, with a thick winter covering of snow. Mr. Vallentin regarded the stone-rivers as having originated *in situ*, the rocks being laid bare by the removal of the covering of soil. The writer finds, however, that the explanation of Wyville Thompson, which supposed the rocks to have been carried to their present situations by a downward creep of the saturated soil-cover, as still the most probable, and he devotes a large part of the paper to a general consideration of this method of transport. He cites what appears to be a remarkably similar phenomenon observed in the Hunsrück by A. Leppla, the only difference being that the more or less plastic medium in which the quartzite fragments make their descent to lower levels is in this case not peat, but a disintegrated clay-slate. The objection to Thompson's theory is that we have no proof that the supposed means of transport

is effective at the present day, and Herr Stechele suggests that the origin of the "stone-rivers" may be attributed to the end of the Ice Age, when the downward movement of the blocks would be favoured by the saturation of the clays and sands by melting snow. In any case, he thinks that the phenomenon is not an isolated one, but that other accumulations of rock may have been formed in a similar way. Although the idea of accumulation *in situ* finds no favour with the writer, it seems not impossible that this may be applicable in certain cases, for, when there is an alternation of harder and softer strata, it is conceivable that the removal of the latter by slow percolation of water might leave on the surface an accumulation of rock-fragments at a lower level than that of the country on either side.

AUSTRALASIA AND PACIFIC ISLANDS.

The Magnetic Survey of the Pacific.—Prof. L. A. Bauer, one of the originators of the project for the magnetic survey of the Pacific under the auspices of the Carnegie Institution (*Journal*, vol. **25**, p. 462; **27**, p. 92; **28**, p. 184), has lately summarized, in *Terrestrial Magnetism*, the *National Geographic Magazine* (September, 1907), and elsewhere, the results attained during the first two years' work. After sailing from San Diego, California, on March 2, 1906, the *Galilee* visited Fanning island, the Samoan group, Fiji, Jaluit (Marshall islands), and Guam, from which last sail was set for Japan. At Yokohama the ship was blown on to the breakwater during a typhoon, but the damage was repaired and the *Galilee* reached San Diego on October 20, 1906. Comparisons were made between the ship's instruments and those of the observatories at Apia and Yokohama, as well as of Mr. G. Heimbrod at Suva, Fiji islands. Throughout the cruise observations of the three magnetic elements were made as frequently as the weather and sea-conditions would permit, and the preliminary reductions have shown that they attained a most satisfactory degree of accuracy. The need of the survey, both from a practical and scientific standpoint, is shown by a comparison of the charted and observed values of the magnetic elements. Between San Francisco and Honolulu the former are too small by amounts ranging from 1° to 3° in respect of declination, and by about 1° in respect of dip; while the charts of equal horizontal intensity give values too high, on an average, by $\frac{1}{25}$ part. Prof. Bauer points out that a vessel might thus, during a foggy or cloudy passage, find herself too far north by about $\frac{1}{60}$ of the distance between those two points, *i.e.* roughly, 35 miles, or enough to prevent a successful landfall. Owing to the care taken to reduce to the utmost the iron and steel used in the equipment of the *Galilee*, the magnetic constants of the vessel were unusually small, though not small enough to obviate corrections on this score, and Prof. Bauer urges the importance of securing for oceanic magnetic work an entirely non-magnetic, specially built vessel. For close-shore work it would be unsafe to dispense entirely with auxiliary motive power, but this could be supplied by a gas or gasoline engine, in which but a very small amount of steel is required.

POLAR REGIONS.

Mr. Shackleton's Expedition.—Mr. E. H. Shackleton left London on October 31 for Lyttelton, New Zealand, whence the united expedition is to sail on board the *Nimrod* for King Edward VII. Land on the first day of the New Year. Writing from Cape Town on October 4, Lieut. England reported that up to that point the *Nimrod* had encountered a large proportion of adverse winds, and had been under steam nearly the whole time. She had been tossed about a good deal,

and on one occasion Mr. James Murray, the biologist, was flung against the ship's rail with such force that he sustained a broken rib. Lieut. England expresses himself as perfectly satisfied with the vessel, and speaks of all on board in the highest terms. The voyage from Torquay to Cape Town was performed in fifty-seven days, at an average speed of about $5\frac{3}{4}$ knots an hour, the longest day's run being at the rate of nearly 8 knots an hour. While under sails alone, the *Nimrod* showed that under favourable conditions she could do nearly 6 knots an hour. On account of the adverse winds, it was found impracticable to "swing" the ship for variation once every 500 miles. The operation was carried out some half a dozen times between England and the Cape, and on various occasions the ship's boat was sent away to collect biological specimens.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Recent Earthquakes.—The month of October was marked by an outbreak of seismic activity in several distantly separated parts of the world, and several of the earthquakes have been heard of directly, in addition to being known from long-distance seismographic record. To commence with the one nearest home, the classic region of Calabria was again the scene of a destructive earthquake, which, with dramatic irony, coincided with the date fixed for the formal opening of villages rebuilt after the shock of September 8, 1905, and again laid in ruins on October 23, 1907. The centres—for, like that of two years ago, it seems to have had several centres—of destructive violence coincided in part with those of the earlier shock. It was destructive at Pizzo, Tropea and Monteleone. The districts north of this, which were destroyed in 1905, seem to have escaped any serious damage, as also Palmi and its neighbourhood, but, further south, the shock caused damage in varying degree over the greater part of Aspromonte. Ferruzano and Brancaleone, on the eastern coast, are reported as having been completely destroyed, 228 people having been killed and 430 wounded at the former of these two places. The accounts of the earthquake, no less than the distant seismograph records, show that the shock was considerably less than that of 1905, of which it may be regarded as an after-shock of more than usual severity. At an earlier date, and in a more distant locality, a severe earthquake took place in Bokhara on October 21. The first accounts, received through Tashkent, stated that the town of Karatag had been completely destroyed, and that the governor and his mother were the sole survivors of 15,000 inhabitants; later information showed that there was a good deal of Oriental exaggeration in this, but the distant records prove that there was in reality an earthquake of the first magnitude in that region on the date of the destruction of Karatag. Another great earthquake recorded by seismographs took place on October 16. The origin lay somewhere in the North Pacific, and this earthquake seems to have got into the newspapers in the shape of a telegram dated November 8 from San Francisco, to the effect that the captain of a whaler reported that a terrific earthquake occurred in the previous month in the island of Unalaska, where "McCulloch peak, which was created by an earthquake a year ago and towered 3400 feet above the sea-level, has dwindled to nothing." There is no doubt that a very severe earthquake did occur in the region and at the time indicated, but the details are evidently inaccurate. The peak referred to is probably the new member of the Bogoslov group (cf. *Journal*, vol. **29**, p. 228), formed by a volcanic eruption last year. It was first sighted by the revenue cutter *Perry*, and known as Perry peak, but has since, we believe, been the object of a more detailed examination by a vessel named *McCulloch*. In connection with these earthquakes, though there need be no connection of a causal character, may be noticed the report of renewed activity of the eruption of Matavanu in Savaii, which commenced on August 1, 1905,

and has been more or less continuous ever since, having during this period poured out a mass of lava which, after covering a tract of country over 10 miles in length, with a breadth of from 1 to 3 miles, has filled the lagoon for a distance of 5 miles along the coast, and thrust forward several small promontories beyond the fringing reef.

Constitution and Figure of the Earth.—That the results of modern seismological observations may throw a new and unexpected light on the nature of the Earth's interior and the relation of this to its external form, has been pointed out by Mr. R. D. Oldham in communications made to the Geological Society within the past two years. The first of these, printed in the *Quarterly Journal* of that Society (1906, pp. 456–475), dealt with the difference in physical properties which seems to exist between the central core and outer layers of the Earth, as indicated by the behaviour of the earthquake waves in passing from one side to the other. In the second communication (printed in the *Quarterly Journal* for 1907, pp. 344–350) Mr. Oldham shows how similar considerations may throw light on the possible differences of constitution between the portions which underlie oceans and continents, thus supplying a much-needed help towards an understanding of the mode of origin of the former. The two great earthquakes of 1906—those of Colombia and San Francisco—had their origin in spots so placed that while in the former case the path of the earthquake-waves towards the European observatories lay in the main under the bed of the ocean, in the latter the waves ran for the greater portion of the distance under continents or the continental shelf. The data at his disposal permit Mr. Oldham to calculate the relative rates of propagation of the first and second phases of the two earthquakes, and he finds that the intervals between the arrival of the two kinds of waves were distinctly greater (after correction for difference of distance) in the case of the Colombian earthquake, with its oceanic wave-path, than in that of San Francisco, where the path was essentially continental; far greater, in fact, than is to be accounted for by errors of record or interpretation. The obvious explanation is that the constitution of the Earth under the ocean is different from that under a continent, and that the ocean basins are not merely irregularities of the surface, but intimately bound up with the constitution of the Earth itself. The Japanese records of the San Francisco earthquake also seem to indicate that the material under the Pacific transmits the second-phase waves at a slower rate, as compared with the first-phase waves, than the material under the continents. Mr. Oldham finds, further, that when the waves pass at a greater depth below the surface than about a quarter of the radius, the difference in the rate of propagation of the two kinds tends to diminish, and he therefore supposes that the differences in the matter beneath the continents and oceans do not extend inwards beyond about that proportion of the radius. He allows, however, that further data are required before these conclusions can be positively accepted.

The Curves of Rivers.—Sir Oliver Lodge, in a letter to *Nature* (November 7, 1907), calls attention to "a curious obsession as to matter of fact" with regard to the relative velocity of current on the inner and outer sides of the curves of a winding river. According to him, more than one author, "obfuscated by an erroneous theory," has been mistaken in describing the flow as being more rapid on the outer side of the curve, and in attributing the well-known scouring action of the stream on the concave bank to this "imaginary more rapid flow." He further states as a fact "that the flow is most rapid on the inner or sediment-depositing side of the bend," and quotes in support of this statement some observations by Prof. James Thomson which were laid before the British Association at Glasgow in 1876. Prof. Thomson's explanation, according to Sir Oliver Lodge, was virtually as follows: "The rapid flow on the inner and strongly curved side

of the bend piles up the water on the outer side by centrifugal force, so that near the concave bank it is nearly stationary, but elevated; its energy there is potential, not kinetic. Now, if the rapidity of flow were uniform from top to bottom, the slope would be in equilibrium; but owing to the retardation of the bend the flow near the bottom is slower, and there is not nearly so much centrifugal force exerted down below. Wherefore the piled-up water is continually returning from upper to lower level, that is from the concave to the convex bank, as an undercurrent, almost at right angles to the main stream, bringing with it, by its undertow, silt and solid matter, which it deposits near the inner side of the bend, thus constantly increasing its own sinuosity in the well-known way. The stream itself, combining a progressive with a lateral circulating motion, may be said to *screw* itself like a corkscrew round the bend; and it is the lateral circulation which shifts the bed." Reference, however, should be made to the original paper by Prof. Thomson in *Proc. Roy. Soc.*, vol. **25**, p. 5, the following passage in which gives his explanation of the transportation of silt from the outer to the inner side of the curve: "But the layer of water along the bottom, being by friction much retarded, has much less centrifugal force in any bar of its particles extending across the river; and consequently it will flow sidewise along the bottom towards the inner bank, and will—part of it at least—rise up between the stream-line and the inner bank, and will protect the bank from the rapid scour of that stream-line and of other adjacent parts of the rapidly flowing current; and as the sand and mud in motion at the bottom are carried in that bottom layer, they will be in some degree brought in to that inner bank, and may have a tendency to be deposited there." The rising-up of the bottom-water between the stream-line and the river-bank is an important point, and suggests that the statement that the flow is more rapid on the inner side of the bend requires some qualification. There should be no difficulty in determining the relative surface-velocity on the two sides of the curve by actual observation. An important part of the work which is being carried out in connection with the Rivers Investigation consists in determining accurately, by floats, the surface-velocity of the current on both sides and in the centre of the rivers along a measured length of channel. For obvious reasons, the observations have been made where the channel is straightest and most uniform in depth and breadth, and they are therefore useless for this particular purpose. Similar experiments, however, could be carried out at a series of bends in any river, and, further, a form of float could be devised with an object suspended from it which might illustrate the corkscrew course of the water.

Natural Bridges.—Prof. Früh, of Zürich, gives an exhaustive analysis of the varied forms of "natural bridge" in a paper entitled "Ueber Naturbrücken und verwandte Formen, mit spezieller Berücksichtigung der Schweiz" (St. Gallen, 1906). The term is used by him in its widest sense, to mean a path, passage, road, tunnel, *i.e.* any means of transit across a natural obstacle to traffic. Prof. Früh divides the subject into three main sections:—A.—Bridges conditioned by unstable tracts of land, *e.g.* a marsh, across which a stream constitutes a natural highway or bridge. B.—(i.) Means of overcoming obstacles such as hollows, rifts, ravines, etc., when these are unbridged, *e.g.* (*a*) Hollows which can be cleared at a leap, being narrow either at the surface or below, at an accessible depth, such as the French *pas*, for example, the Pas de l'Ase in the Causse Noire, also the countless dykes of Holland; (*b*) broad ravines, with accessible floors, over which moderate-sized streams flow, which streams can be crossed by a series of leaps *viâ* rock masses lying in the beds, for example, the Sihlsprung between Menzingen and Hirzel, blocked by nagelfluh. Comparable with this form, though on a far larger scale, is Adam's Bridge, between India and

Ceylon. (ii.) The various natural bridgings over of hollows, rifts, ravines, etc.: (*a*) When a spur of land projects, hanging, over the hollow; (*b*) when the bottom of the ravine itself is such as to form a way instead of the top; (*c*) when fallen masses bridge over crevasses or eroded valleys, such as snow-bridges over crevasses, heaps of volcanic *débris* across dry valleys, masses of rock and ice across high-level mountain valleys, etc.; (*d*) when partially exposed valleys which have been eroded underground are naturally spanned—many examples in the Karst districts. C.—Rock doorways, borings, perforations, etc., through sea-coast cliffs, islands, reefs, by the action of the wind, waves, etc.; for example, the Old Man of Hoy. Many subdivisions are made, and the whole is copiously illustrated by examples taken from all parts of the world, chiefly from Switzerland in section B. Four views taken from photographs and a few diagrams also illustrate section B. This short work contains a great amount of condensed information, including, at every point, valuable references, which constitute an extensive bibliography on the subject.

GENERAL.

The Death of Captain Cook.—Some attention has lately been drawn in New South Wales to a version of the death of Captain Cook obtained many years ago, during a visit to Hawaii, by Captain Charles, now a veteran of ninety years, and a member of the Legislative Council of that State. A copy of the statement, written down at the request of the Governor, Sir Harry Rawson, has been kindly sent to us by the Hon. Bruce Smith, K.C., a member of the Federal Parliament. Visiting the scene of the navigator's death in March, 1850, Captain Charles met with an old man who had been present at the catastrophe, his recollections of which he recounted to his visitor. Among other points, he stated that Cook stumbled in a drain or crack in the flat lava-rock, and, falling, was thereupon killed; also that the reason for the sudden hostility of the natives was the desecration of their sacred ground and altar by the white men, who landed spars at the spot, took up their residence at the temple, and spread sails over the altar. While any tradition regarding this tragic event deserves impartial consideration, it cannot be said that this particular story is such as to merit acceptance in preference to the far better authenticated versions which we previously possessed. Like the account recorded in the *Athenæum* for August 16, 1884 (to which our attention has been called by Prof. J. K. Laughton, and which has some features in common with that given to Captain Charles), it rests merely on native recollections or traditions of the event current many years after, to set against which we have not only the narratives of actual participators in the occurrences, carefully recorded at the time by Cook's officers, but the much earlier native versions given to European visitors. Thus Ellis, in his 'Narrative of a Tour through Hawaii,' published in 1826 (pp. 100 *et seq.*), gives the results of his careful inquiries addressed to natives acquainted with the circumstances, and these confirm in a most satisfactory way the general accuracy of the version recorded by Captain King, while giving no hint of any breach of tabu as responsible for the hostilities. That such was their cause is rendered the less probable by the quasi-deification received by Cook, and the fact that tabu had constantly been imposed by the priests *in his favour*. There is, besides, nothing mysterious or inexplicable in the generally accepted version which might dispose us to question its truth, if we remember the sudden changes of mood to which uncivilized races are notoriously liable, and the friction so often induced, in their first intercourse with white men, by their inability to resist the temptation offered by the sight of objects—particularly iron—representing untold wealth in their eyes. For the theft of the boat, which was the immediate cause of the trouble, was, according to Ellis's informants, due to the attraction presented by

the iron nails used in its construction. The marvel is, not that hostilities should have broken out on this occasion, but that Cook should have passed unscathed through so many previous situations fraught with risk of a similar catastrophe.

OBITUARY.

Mr. Howard Saunders.

The loss sustained by science, and especially by the science of ornithology, in the death of Mr. Howard Saunders, at the age of seventy-two years, will be long and widely felt. His exceptionally high position, and his valuable services from that point of view, have been ably recorded elsewhere. But Mr. Howard Saunders was a many-sided man, and this Society has to mourn the loss of a warm friend to geography, who had prepared himself for a seat on our Council by extensive travel. The present writer first made his acquaintance forty-eight years ago, when he was in a mercantile house at Lima. He was then a very young man, taking an intelligent interest in geographical research and in the distribution of the avi-fauna of Peru. In few places are the gulls and terns so closely gathered together as in Callao bay and round the Chincha islands. Their study was fascinating, and it is probable that young Howard Saunders first conceived a predilection for this branch of ornithology during his residence at Lima. On leaving Peru he undertook a remarkable journey across the Andes and down the Amazons to Pará, a much more difficult undertaking in those days than it is now. While diligently continuing his ornithological studies after his return, he paid several visits to Spain in pursuance of his favourite branch of science, where his knowledge of the language enabled him to carry out his researches with valuable results. In 1882 Mr. Howard Saunders took over from Prof. Newton the editorship of the fourth edition of 'Yarrell's British Birds,' and seven years afterwards he brought out his own excellent work, the 'Manual of British Birds.' A second edition was called for, and was published in 1899, which is still a standard book of reference. It was followed by his great work for the British Museum on 'The Gulls of the World.'

Mr. Howard Saunders was elected a Councillor of the Royal Geographical Society in 1893, and, except for one short interval, he continued to serve on the Council to the day of his death. It may safely be said that the Council has never had a more conscientious attendant at its meetings and at those of its Committees. He scarcely ever missed, nor were his attendances confined to mere discussion. His advice was always weighty, his conduct loyal and sensible, especially during the fitting out of the Antarctic Expedition. But, as has been said, he did not confine his support to words. He was always ready to help actively, and, with other work, he undertook the ornithological section of the 'Antarctic Manual.'

Mr. Howard Saunders was the first authority in Europe on gulls and terns, and this gave his section of the Manual a very special value. It showed his intimate knowledge of the narratives of every voyage that ever crossed or approached the Antarctic Circle, and is an interesting and pleasant essay for the general reader, touching as it does, with special knowledge, on such episodes as the shooting of the albatross in Shelvocke's voyage, which supplied Coleridge with the idea elaborated in the "Ancient Mariner." The essay is accompanied by a descriptive list of the Antarctic birds. The task was no easy one, as is shown by the somewhat difficult investigation Mr. Howard Saunders had to make with reference to a statement that one of the "sheathbills" had once been shot within the Antarctic Circle. Mr.

Howard Saunders was remarkable for the thoroughness and accuracy with which he did everything he undertook.

The loss of this distinguished naturalist will be very widely felt. Amiable and kind-hearted, he was always ready to assist others, and he was valued as an able and diligent colleague, as well as an agreeable acquaintance and a good and most reliable friend. The Council of this Society will feel, with me, that mine is the language of truth.

C. R. M.

Prof. Angelo Heilprin.

We regret to announce the death of Prof. Angelo Heilprin, the founder and first president of the Geographical Society of Philadelphia, and a Fellow of our own Society since 1896. Though only fifty-four years of age, and though much of his earlier work was concerned with other branches of science, Prof. Heilprin had long played a prominent part in encouraging the study of geography on scientific lines in the United States. Born at Satoralija-Ujhely in 1853, the son of one of the leaders in the Polish struggle for independence, who shortly afterwards was driven into exile, he was educated in the United States, taking a special interest in the study of geology. After further studies in London, Geneva, and Vienna, he returned to America, and in 1880 was appointed professor of invertebrate palæontology and geology at the Academy of Natural Sciences in Philadelphia. This and other positions he occupied at Philadelphia till, twenty years later, he accepted the offer of a chair of geography at Yale University. An ardent advocate of field-work, which he prosecuted in numerous summer excursions, including the Peary auxiliary expedition of 1892, Prof. Heilprin took a special interest in the problems of North, Central, and South American geography, and in questions relating to the Arctic regions. The results of his investigations and studies appear in numerous writings, that which first brought him to the notice of geographers being his handy treatise on the distribution of animals, which appeared in 1887 in the 'International Scientific Series.' Two years later he published an important monograph on the 'Physical History and Zoology of the Bermuda Islands,' after the appearance of which he undertook an expedition, on behalf of the Philadelphia Academy of Natural Sciences, to the great volcanoes of Mexico, the heights of which he for the first time determined by accurate barometric measurements. His later work included researches at the sites of the West Indian volcanic catastrophes of 1902, on which he published various memoirs, as well as a book entitled 'Mont Pelée and the Tragedy of Martinique' (1903). On a later visit, he paid special attention to the remarkable pillar or obelisk left standing as a result of the later phases of the Pelée eruption. Lastly, he has left a monument to his great industry in the latest edition of 'Lippincott's Gazetteer,' in the preparation of which his brother also took part.

Mr. J. F. Mann.

The death at Sydney, New South Wales, on September 7, of Mr. John Frederick Mann removes the last survivor of the expeditions undertaken by the ill-fated explorer, Dr. Ludwig Leichhardt, into the interior of Australia in the forties of last century. Mr. Mann was a son of General Cornelius Mann, R.E., who sometime held command at Gibraltar, and was intended for a military career. But after passing through Sandhurst he first joined the Trigonometrical Survey of Great Britain; and then, in 1841, when twenty-two years of age, went out to New South Wales, being drawn to a colonial career by the example of his friend

the late Sir George Grey. The long interval which elapsed without news of Dr. Leichhardt on that explorer's journey across North-Eastern Australia from Brisbane to Port Essington in 1844–45, led Mr. Mann to make preparations for a relief expedition; and when the news of Dr. Leichhardt's safety rendered that project unnecessary, he offered his services to the explorer, and accompanied him on his next expedition, when an unsuccessful attempt was made to cross the continent from east to west. Remaining behind when Dr. Leichhardt set out on his last journey, Mr. Mann joined the Survey Department of New South Wales in 1848, and maintained his connection with that branch of the public service till 1875, taking an active part in exploring and mapping the colony. For several years before his death he rendered further service to the cause of geography in New South Wales as honorary secretary of the branch in that state of the Royal Geographical Society of Australasia.

CORRESPONDENCE.

On the Influence of Ice-melting upon Oceanic Circulation.

I FEEL bound to reply in a few words to the critical remarks which Captain T. H. Tizard has done me the honour to make regarding certain statements in my paper on Oceanic Circulation (*Geogr. Journ.*, **30**, No. 3, p. 273).

The paper contains some conclusions drawn from recently discovered analytical facts which Captain Tizard considers more appropriate to the Chemical than to the Geographical Society. I do not think, however, that the members of the Chemical Society would have taken much interest in the fact that there is a deficiency amounting to $\frac{2d}{1000000}$ of halogens relatively to other saline components in the bottom water of the Norwegian sea, etc. Such details are of interest only to those sciences of which they can elucidate some pending problem.

In 1899, a number of hydrographers, with Sir John Murray in the chair, assembled in Stockholm to lay down the programme of an international investigation of the sea. Part of this programme was the determination of the physical and chemical properties of sea-water, which has resulted in the present standardization of the methods and the constants of hydrographic science. Side by side with this labour there has been a movement in a seemingly opposite direction, viz. to discover small irregularities and local exceptions from the average numbers in order to trace the origin of sea-waters by certain marks in their chemical composition, planktonal and gaseous contents, etc. The scientists engaged in this task—*quorum pars minima fui*—have not been so successful in their endeavours to individualize, as their colleagues in their efforts to standardize the properties of ocean water. Now and then, however, there appears, often very unexpectedly to the observer, some new fact which acts like a kind of *Leitmotiv*, directing our attention to some hidden agent at work in the depths of the sea.

In my two last papers in this *Journal* I have called attention to such an agent, viz. the ice-melting in the ocean, which, according to my view, has a preponderating influence upon the circulation of its waters. The present theory ascribes the circulation to atmospheric influence of thermic and mechanical kind. The principles of the ruling theory are aptly summarized in Nansen's words—*

"According to my view, the chief cause of the circulation of the sea is the combined effect of the cooling of the water and of the winds. I do not believe that

* *Geogr. Journ.*, September, 1907, p. 297.

ice-melting has much influence in this respect; I think it has practically no effect upon the cooling of the sea, because the ice is formed and melts in the same sea, and the heat which is disengaged the moment the ice is formed is again engaged by the melting process, so the direct cooling effect of these processes is *nil*."

And further—

"The circulation of the sea has no resemblance whatever to rivers; it means the continuous movement of the whole water-masses from the surface to the bottom and over the whole area of the sea."

This is quite in accordance with the theory propounded thirty-five years ago by Zöppritz, which, strange to say, still rules the minds of the oceanographers of the present day. The ocean borrows its store of heat, its temperature, and its energy of motion from the atmosphere; the motion imparted by the winds to the waves is propagated from the surface to the bottom layer until the entire mass of water is in motion, etc.

I have ventured, on the contrary, to suggest the idea that the ocean on the whole does not take its motive power second-hand from the atmosphere, but directly by radiation from the sun, and that it contains in itself sources of energy and fields of forces superior to those existing in the air. I hold that there is in activity in the ocean a thermodynamic cycle of transformations of solar energy between the tropical and the Arctic and Antarctic regions, which has its upper limit of temperature at $T = 300°$ (27° C.), and its lower limit at the point of equilibrium between ice and sea-water at $T = 271°$ (−1°·9 C.), and that the mechanic effect of that cycle approaches the theoretical limit as closely as that of the best engine ever constructed, and even leaves a surplus of *work* sufficient to rule part of the movements of the undermost layer of the atmosphere and the changes in the climate and the weather of the countries bordering upon the ocean. I have compared this cycle to that of an engine of which the boiler is placed in the tropical and the cylinders in the Arctic and Antarctic regions of the ocean, where the mighty ice-caps which cover the polar seas form the condensers. I have also tried to explain why the transformation of heat energy into work—as every other transformation in nature—takes place at the *surfaces of contact* between the air and the water in the warmer and between ice and water in the colder regions of the sea.

I am aware that this must sound paradoxical, and I regret not being able, in papers written for this *Journal*, to hold forth side views and show up points of transition between my views and those of other hydrographers.

I am also aware that this will remind many of us of the controversy between the upholders of the physical and the mechanical theory of oceanic circulation debated so eagerly forty years ago. A scientific debate must come to a close when all available arguments are used up. Such was the case then. I think, however, that we have gained new ground to stand upon since Croll's and Carpenter's time, and that the old question can and must be taken up again. The theory of Zöppritz, or the "wind-theory" as it is usually called, has outlived itself. The celebrated papers of Zöppri'z in the *Annalen* will retain their value as specimens of hydrodynamics, but of the great structure of consequences which Zöppritz and others had deduced from that theory concerning oceanic circulation there is not left one stone upon another, for the following reason. Zöppritz regarded the waters of the ocean as a homogeneous fluid, while experience shows that there exists a kind of stratification in the ocean, lighter water-layers being superposed upon waters of higher density. In some measure this holds also for the atmosphere. Two important consequences arise from this.

First, partic'es which belong to one layer have a tendency to remain in the same layer. Consequently the motions imparted to the uppermost water-layer by the

winds will not be propagated to the next. The same will hold for convection currents caused by the cooling influence of the atmosphere upon the surface waters.

Of course, motion in one layer may induce motion in an adjacent layer by impact or by friction, but such motions usually result in undulatory motion (such as submarine waves and seiches, water whirls, etc.), and are soon quenched by the reaction from the second layer. A particle belonging to the upper layer will not transfer its motion to a particle in the next (because it cannot penetrate into that layer), but to a number of particles or, so to speak, to the entire mass of water contained in that layer. If the ocean consisted of a homogeneous fluid, as Zöppritz imagined, the winds would cause a circulation of the same kind as that Sir John Murray found to exist in certain Scottish lakes, *i.e.* it would gradually bring up the bottom waters to the surface and *vice versâ* by updrift. Under the circumstances really existing in the ocean, the strongest wind continually blowing would never bring a single particle of the deepest water-layers into contact with the atmosphere, or sink a particle of surface water to the bottom, because the circulation caused by the wind would be limited to a relatively thin upper stratum. We have found that in the Baltic, which furnishes a typical example of stratification, movements of the surface waters cause great dislocations in the undermost layer, without, however, being able to call forth a circulation in *the vertical direction* between the different strata. The only agent which can do this is the melting of ice in sea-water. Or, as I have expressed it, "The cool and dense sea-water of more than 1·028 specific weight which descends to the depth of the sea in the regions where the ice-melting process takes place breaks through all intermediary water-layers, and, by aërating the bottom water, creates the conditions necessary for organic life in the abysses of the ocean." This is the reason why I have propounded the ice-melting theory.

Secondly, every medium in which stratification takes place under the influence of gravitation is in a state of equilibrium, and is consequently a conservative system which reacts against disturbances. The very faint tendency to stratification * which exists in the atmosphere is sufficient to establish a certain stability in the *vertical* movement of the air. Over every heated area of the Earth the air ascends, expanding its volume *adiabatically*. The influence of earth-rotation will convert this ascending motion into a gyratory motion, *i.e.* into a cyclone, in case the ascending column possesses a sufficient store of heat energy to break through the surrounding strata; if not, *i.e.* if the buoyancy of the air has been reduced below that of the surrounding medium, the cyclone is quenched in its birth.

The stratification is far more marked in the hydrosphere than in the atmosphere, and the conservative tendency is consequently stronger, so strong, indeed, that it compensates the influence of every wind which does not blow continually in the same direction. Sandström † has shown, from actual observations at Bornö, in the Gullmarfjord, that every time a gale ceases to blow, the reactive power of the ocean sets up a counteraction which tends to restore the *status quo ante*. Thereby the pivot of the wind theory or the *theory of the cumulative effect of the wind upon the waters is withdrawn*. The local effect may be as great as possible, the total effect will be *nil*, unless the wind, as before said, blows continually from one direction. In such case its effect will be to impart a gyratory motion to the waters of the adjoining layers with a rapidly increasing deviation from the

* I suppose that this tendency is due to the inhomogeneity of the atmosphere (*vide* Dalton's theory of the co-existence of different kinds of atmospheres: (CO_2, N_2, H_2O, etc.).

† Sandström has published his discovery in an excellent little paper in the 'Publications de Circonstance de l'exploration Internationale de la Mer,' to which I wish herewith to direct the attention of hydrographers.

original direction on account of the Earth's rotation. W. Ekman has shown that actual wind currents can only exist at the surface of the open sea and do not extend to great depths, for as soon as the wind looses its hold upon the water-particles their motion will be ruled by the influence of the Earth's rotation.

Concerning the other points of divergence between Captain Tizard and myself I can be brief. I think that I can maintain the statement that the bottom water of the eastern side of the Barents sea, which has −1·7 up to −2° C. temperature, is, as far as we know at present, the coldest and saltest in existence. The extremely low temperature found by Ross (1818) in Baffin bay, and others, must be ascribed to the imperfect instruments of that time.

The ice-melting theory does not imply of necessity that the bottom temperature must be the same in all parts of the ocean. Ridges and submarine banks intercept the flow of the coldest bottom water and skim off waters of a somewhat higher temperature and less density according to the position and the elevation of the ridge, as, *e.g.*, the Iceland Færoe and Wyville-Thomson bank, the Valdivia ridge, etc. We know too little of the conditions of the deep waters of the North Atlantic to decide whether it has its chief origin in the Arctic or Antarctic sea. I must, however, call attention to the fact that the discharge of cold bottom water from the Norwegian sea over the crest of the Iceland-Færoe and Wyville-Thomson ridge (see Fig. 3 on p. 280), and also the masses of Gulf Stream water which sinks to the bottom of the Atlantic off Newfoundland cooled and diluted by the ice-melting, must meet the cold bottom current from the southern hemisphere at some place which cannot well be northlier than the southern edge of the Newfoundland banks, but probably is situated nearer to the equator, where the rising of the isotherms indicates an accumulation of cold bottom water from below. I do not think that this cold water rises to the surface under the equator, although there certainly is a tendency in the water to ascend. In my original paper * I have discussed this question, with the result that the place where the cold deep water rises to the surface is not the equatorial, but probably the central tropical parts of the ocean, a result which, although it may be contrary to the ruling opinion among hydrographers, is nevertheless borne out by the dynamic diagram of forces (solenoid-diagram after Bjerknes) delineated on Plate II. of the paper in question. We know too little of the hydrography of the Gulf Stream and the "cold wall" on the American side of the Atlantic to be able to trace with security the origin of its waters.

This brings my thoughts to bear on the last critical remark of Captain Tizard concerning my statement that, the Atlantic is hydrographically a "*mare incognitum*," an expression which, of course, is meant to be taken *cum grano salis*.

The fact is that, although we know a great deal of the topography of the Atlantic basin and something of the statics of its hydrographic conditions, we still lack the elementary data necessary to account for the circulation of its waters. What do we know of the *vis movendi* of the great Atlantic warm-water current called Gulf Stream? What do we know of its velocity, its variations, its periodicity? Has anybody yet executed a cross-section of serial soundings of the Labrador Current? or traced the course of the cold water which vanishes from the surface off Newfoundland?

A multitude of problems of the highest importance to mankind are waiting for their solution by a systematic survey of the Atlantic. The leaders of the great expeditions with the *Challenger*, the National, the *Valdivia*, and others, have shown

* "Ueber die Wahrscheinlichkeit von periodischen und unperiodischen Schwankungen in dem Atlantischen Strom" ('Svenska Hydrografisk Biologiska Kommissionens Skrifter.' Göteborg and Berlin: J. Springers Verlag).

the way how to attack those problems, but they have also shown the insufficiency of isolated reconnoitring expeditions to master the paramount question—the oceanic circulation. Only a systematic survey can do that. The results obtained by the scientists of the said expeditions have furnished the base for a future research, *severunt arbores quæ alteri sæculo prosint.* May we hope that the century which shall complete their work will be ours, not the next or next-next!

O. Pettersson.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1907–1908.

First Meeting, November 11, 1907.—The Right Hon. Sir George T. Goldie, K.C.M.G., D.C.L., LL.D., F.R.S., President, in the Chair.

The President said—

Geography in the Civil Service.

I do not propose to revive the former practice of giving at this opening meeting of our session an account of the geographical events during our four months' recess; it is more convenient, as I think I explained to you last year, that these should be dealt with at the annual meeting when the President has to deliver his address, so as to make the geographical history of the year complete in itself. There is one subject, however, which I might mention in a few words—I shall have to reserve any fuller comments for my annual address in May—and that is, the Civil Service examinations of this country. I dare say many of you may remember that in the summer of last year there was a retrograde step taken in striking geography out of the examinations for the Foreign Office. We never complained, nor do I now complain, of the action taken in that respect; it was simply bringing the examinations for the Foreign Office into line with the examinations of the rest of the Civil Service of this country, and from an organizing point of view it appeared sound, but so far as geography was concerned it was a retrograde step. However, we thought we would take advantage of that to make a forward move. It is not quite twelve months since I had the pleasure of firing the first shot at an address which I gave to the Scottish Geographical Society in Edinburgh. I need not tell you the story of the last twelve months; it is rather interesting, and I shall have to tell it at the Anniversary Meeting in May. The result has been, as you may have seen in the papers a few days ago, that geography henceforth will be one of the subjects of examination for all the Civil Service examinations of this country. I will reserve my comments for a future time.

The late Mr. Howard Saunders.

I will briefly refer to the regretted death of Mr. Howard Saunders, who, as many of you know, had been a member of our Council almost continuously since 1893. Although ornithology was his special science, he was also a most distinguished geographer, and he gave unremitting attention to the geographical work in our Society. I will not say any more about his regretted death, because Sir Clements Markham has written an obituary notice of him, which will appear in the December number of the *Journal*, where you will read the interesting career of a most distinguished ornithologist and geographer.

The paper read was :—

"The Great Douglas Glacier of New Zealand and its Neighbourhood." By J. Mackintosh Bell, Director-General of the New Zealand Survey.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are as a rule written in full :—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B = Bulletin, Bollettino, Boletim.
Col. = Colonies.
Com. = Commerce.
C.R. = Comptes Rendes.
E. = Erdkunde.
G. = Geography, Géographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
Jb. = Jahrbuch.
k.k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. (Mém.) = Memoirs, Mémoires.
Met. (mét.) = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. (Riv.) = Review, Revue, Rivista.
S. = Society, Société, Selskab.
Sc. = Science(s).
Sitzb. = Sitzungsbericht.
T. = Transactions.
Ts. = Tijdschrift, Tidskrift.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Alps. **Whymper.**

A Guide to Zermatt and the Matterhorn. By Edward Whymper. Eleventh edit. (pp. xiv. and 224).

Chamonix and the range of Mont Blanc. By the same. Twelfth edit. (pp. xiv. and 206). London: John Murray, 1907. Size 7½ × 5. *Maps and Illustrations. Price* 3*s. each. Two copies, presented by the Author and Publishers.*

Alps. **Penck and Brückner.**

Die Alpen in Eiszeitalter. Von Dr. Albrecht Penck und Dr. Eduard Brückner. Lieferung 8. Liepzig: Chr. Herm. Tauchnitz, [*not dated*]. Size 10½ × 7½, pp. 785–896. *Maps, Sections, and Illustrations. Price* 5*m. Presented by the Publisher.*

Alps. **Rey.**

The Matterhorn. By Guido Rey; with an Introduction by Edmondo de Amicis. Translated from the Italian by J. G. C. Eaton. London: T. Fisher Unwin, 1907. Size 10½ × 7, pp. 336. *Illustrations. Price* 21*s. net. Presented by the Publisher.*

See notice of the Italian edition in vol. **23**, p. 506.

Alps—Meteorology. *Meteorologische Z.* **24** (1907): 193–200. **Prohaska.**

Die Hagelfälle des 6. Juli 1905 in den Ostalpen. Von Prof. Karl Prohaska. *With Maps.*

Alps—Monte Rosa. **Coolidge.**

Il Monte Rosa al XVIII. secolo. Del Rev. W. A. B. Coolidge. (Estratto dalla *Rivista Mensile del C. A. I.*, vol. **26**, No. 4.) Torino, 1907. Size 9½ × 6, pp. 6. *Illustrations. Presented by the Author.*

Austria—Geology. *Deutsche Rundschau G.* **29** (1907): 289–297. **Götzinger.**

Ueber die geologische Bedeutung der Granitklippe mit dem L. v. Buchdenkmal im Pechgraben bei Weyr in Oberösterreich. Von Dr. Gustav Götzinger. *With Illustrations.*

Based in part on a previous paper by G. Geyer (*Verhandl. der K.K. Geol. Reichsanstalt*, 1904), in which conclusions were drawn as to the geological history of this region.

Austria—Istria. *Globus* **91** (1907): 249–254. **Moser.**

Ein Ausflug nach der Sandinsel Sansego. Von Prof. Dr. L. Karl Moser. *With Illustrations.*

Austria—Karst. *Globus* **91** (1907): 297–303. **Mühlhofer.**

Die Erforschung des Magdalenenschachtes. Ein Beitrag zur Studium der Karstphänomene. Von Leutnant Franz Mühlhofer. *With Plan, Section, and Illustrations.*

Austria—Meteorology. ———

Jahrbücher der K. K. Zentral-Anstalt für Meteorologie und Geodynamik. Jahrgang 1905. Neue Folge, xlii. Band. Wien, 1907. Size 12 × 9, pp. xxxiv. [and 266].

Austria—Moravia. *M.k.k.G. Ges. Wien* **50** (1907): 5–27. **Trampler.**

Die mährischen Karsttäler. Von R. Trampler.

Austria—Salzburg. *Globus* **91** (1907): 373–378. **Jaeger.**

Das Gesteiner Tal. Von Julius Jaeger. *Also separate copy.*

Baltic. *G. Anzeiger* **8** (1907): 121–129. **Schmidt and Spethmann.**

Die Ostsee. I. Entstehungsgeschichte der Ostsee. Von Dr. W. Schmidt. II. Die Genetik des südwestlichen Baltikums seit der Eiszeit. Von Hans Spethmann. *With Maps.*

Bulgaria. ———

Bulgaria of to-day. Official edition of the Bulgarian Ministry of Commerce and Agriculture. London, 1907. Size 8½ × 5½, pp. xvi. and 300. *Maps, Diagrams, and Illustrations. Presented by the Balkan States Exhibition.*

A useful summary, dealing with the people, administration, commerce, etc.

Central Europe—Lake of Constance. **Halbfass.**
Deutsche Rundschau G. **29** (1907): 337–347.

Die Verkehrsgeschichte eines Binnensees. Von Wilhelm Halbfass. *With Illustration.*

Central Europe—Phytogeography. *Abrégé B.S. Hongroise G.* **35** (1907): 17–30. **Szabó.**

Eine pflanzengeographische Skizze der Sudeten, mit besonderer Berücksichtigung der südalpinen und alpinen Flora des Riesengebirges. Von Dr. Z. Szabó. (*Földrajzi Közlemények* **35** (1907): 47–59, 96–115. *With Map and Illustrations.*)

Europe—Health Resorts. **Linn.**

The Health Resorts of Europe: a medical and popular guide to the mineral springs, climatic mountain and seaside health resorts, hydropathics, and sanatoria of Europe. By Thomas Linn. Edited by A. C. Glynn Grylls. 15th edit. London: The Health Resorts Bureau, 1907. Size 7 × 4½, pp. 284. *Price 2s. 6d. net. Presented by the Publishers.*

Europe—Zoogeography. **Lobley.**

The History of the Spread of the European Fauna. By Prof. J. Logan Lobley. London, [1907]. Size 8½ × 5½, pp. 18. *Presented by the Author.*

France—Champagne. **Chantriot.**

Émile Chantriot. La Champagne: étude de géographie régionale. Paris: Berger-Levrault & Cie., 1906. Size 10 × 6½, pp. xxiv. and 316. *Maps, Illustrations, and Diagrams. Price 8 fr.*

France—Jura. *Spelunca* **7** (1907): No. 47, pp. 28. **Fournier.**

Recherches spéléologiques dans la chaine du Jura. Par E. Fournier. 7e Campagne, 1904–05. *With Sections.*

France—Paris. **Baedeker.**

Paris and environs, with routes from London to Paris. Handbook for travellers by Karl Baedeker. 16th edit. London: Dulau & Co., 1907. Size 6½ × 4½, pp. liv., 470, and 48. *Plans, etc. Price 6s. Presented by the Publishers.*

France—Pyrenees. *B.S.G. Com. Bordeaux* **33** (1907): 140–147. **Descombes.**

L'aménagement des montagnes dans les Pyrenées Orientales. Par Paul Descombes.

Germany—Bavaria. **Breu.**

Der Kochel-See. Limnologische Studie. Ein Beitrag zur Bayrischen Landeskunde von Georg Breu. (Berichte des naturwissenschaftlichen Vereines zu Regensburg. X. Heft, 1903 und 1904, pp. 121–222.) Regensburg, 1905. Size 9 × 6. *Maps, Illustrations and Diagrams. Price 8s. 6d.*

Germany—Brandenburg. *Naturw. Wochenschrift* **22** (1907): 321-330. **Wahnschaffe.**

Die Seenrinne des Grunewalds und ihre Moore. Von Prof. Dr. F. Wahnschaffe. *With Sketch-map and Illustrations.*

Noticed in the September number (p. 330).

Holland—Glaciation. *Ts. K. Nederlandsch Aard. Genoots.* **24** (1907): 406-448. **Lorié.**

Het interglacialisme in Nederland. (De voorgestelde eenheid van het Ijstijdvak, iii.) Door J. Lorié.

Iceland. **Herrmann.**

Island in Vergangenheit und Gegenwart. Reise-Erinnerungen von Paul Herrmann. 2 vols. Leipzig: W. Engelmann, 1907. Size 10 × 7, pp. (vol. **1**) xii. and 376; (vol. **2**) vi. and 316. *Map and Illustrations. Price* 15*m. Presented by the Publisher.*

The first volume is historical and descriptive, the second gives an account of the author's travels; but even the first is to a large extent interwoven with personal observations.

Italy—Capri. **Lorenzo.**

Atti R.A. Lincei, Rendiconti, Ser. V., **16** (1907): 1 Sem., 853-857.

L'isola di Capri. Di Giuseppe de Lorenzo. *With Sections.*

Italy—Climatology. **Millosevich.**

Atti R.A. Lincei, Rendiconti, Ser. V., **16** (1907): 1 Sem., 615-625.

Dell' influenza della catena degli Appennini sulla distribuzione della pioggia nell' Italia centrale. Del dott. Filippo Eredia.

Italy—Geology. *Petermanns M., Ergänzungsheft* 156 (1907): pp. iv. and 202. **Stefani.**

Die Phlegräischen Felder bei Neapel. Von Prof. Dr. Carlo de Stefani. *Map and Illustrations.*

Italy—Lagoon of Venice. **Magrini and Others.**

Ricerche lagunari, per cura di G. P. Magrini, L. de Marchi, T. Gnesotto. N. 4-5. Programma di ricerche biologiche lagunari. Sulle attinie della laguna di Venezia (pp. 40). No. 6. Le attuali conoscenze sulla flora lagunare ed i problemi che ad essa si collegano. Di A. Béguinot (pp. 20). No. 7. Prima relazione annuale (pp. 16, *Map*). Venezia, 1907. Size 10 × 7.

The map (in No. 7) shows the lines of levelling so far carried out, and the locations of tide-gauges (cf. *Journal*, vol. **27**, p. 298).

Spain—Cordova. **Calvert and Gallichan.**

Cordova: a city of the Moors. By Albert T. Calvert and Walter M. Gallichan. London: J. Lane, 1907. Size 7½ × 5, pp. xvi. and 108. *Plans and Illustrations. Price* 3*s.* 6*d. net. Presented by the Publisher.*

United Kingdom—Antiquities. **Hubbard.**

Neolithic dew-ponds and cattle-ways. By Arthur John Hubbard and George Hubbard. 2nd edit. London: Longmans & Co., 1907. Size 10 × 7, pp. xxiv. and 116. *Plans and Illustrations. Price* 4*s.* 6*d. net. Presented by the Publishers.*

The first edition was reviewed in vol. **26**, p. 443. This contains a considerable amount of new material, a number of additional antiquities being discussed and illustrated.

United Kingdom—Devon. **Jukes-Browne.**

The hills and valleys of Torquay: a study in valley-development and an explanation of local scenery. By A. J. Jukes-Browne. Torquay, 1907. Size 7½ × 5, pp. viii. and 104. *Maps, Sections, and Illustrations. Price* 3*s.* 6*d. Presented by the Author.* [See Review, vol. **30**, p. 548.]

United Kingdom—London. **Barber and others.**

The port of London and the Thames barrage. A series of expert studies and reports on the conditions prevailing in the tidal river and estuary of the Thames; dealing especially with its geological, engineering, navigation, sanitary, trading and commercial aspects, and the effects upon these of various proposals which have been made for improvement of the tidal river as the port of London Comprising independent studies and investigations by T. W. Barber, and by C. J. Dibdin, E. T. Hennell, Clayton Beadle, and D. Urquhart. London: Swan, Sonnenschein, & Co., 1907. Size 10½ × 7½, pp. 194. *Maps, Plans, and Illustrations. Price* 12*s.* 6*d. net. Presented by the Publishers.*

United Kingdom—London. **Beck.**

Memorials to serve for a history of the parish of St. Mary, Rotherhithe, in the County of Surrey and in the Administrative County of London. By Edward Josselyn Beck. With a chapter on the geology of the Thames valley and of Rotherhithe, by the Rev. T. G. Bonney. Cambridge: University Press, 1907. Size 9 × 5½, pp. xvi. and 270. *Plans and Illustrations. Price* 10*s. net. Presented by the Publishers.*

Rotherhithe, or Redriff, as it is even now known in popular parlance, took a fairly important part in early oversea enterprise, and some of the facts here recorded have a bearing on this side of its history, to which, however, less attention is given than could have been wished.

United Kingdom—Scotland. **Geikie and others.**

Memoirs of the Geological Survey of Great Britain. The geological structure of the North-West Highlands of Scotland. By Dr. B. N. Peach, Dr. J. Horne, W. Gunn, C. T. Clough, and L. W. Hinxman, with practical chapters and notes by J. J. H. Teall. Edited by Sir Archibald Geikie. Glasgow, 1907. Size 10 × 6, pp. xviii. and 668. *Map, Sections, and Illustrations. Price* 10*s.* 6*d. Presented by the Geological Survey.*

ASIA.

Central Asia. **Grum-Grjimailo.**

Travels in Western China. By G. E. Grum-Grjimailo. Vol. 3. Round the Koko-nor, across the Nan-shan, Be-shan, and along the eastern Tian-shan. [In Russian.] St. Petersburg, 1907. Size 12½ × 9, pp. vi. and 532. *Maps and Illustrations. Presented by the Imperial Russian Geographical Society.*

Central Asia—Tian-Shan. **Keidel.**

Einige Berichtigungen zu meinen Arbeiten über den Tian-Shan. Von H. Keidel. (Separat-Abdruck aus dem Centralblatt für Mineralogie, Geologie, und Paläontologie. Jahrg. 1907, No. 9.) Stuttgart, 1907. Size 9 × 6, pp. 271–275.

Corrections to the memoir referred to in vol. **39**, p. 357, of the *Journal*, necessitated by the author's absence when the proofs were revised.

China—Shantung and Kiangsu. **Garnett.**

China. No. 1 (1907). Report by Mr. W. J. Garnett on a journey through the provinces of Shantung and Kiangsu. London, 1907. Size 13 × 8½, pp. 26. *Maps. Price* 6*d.*

China—Yangtse Provinces. **Bons d'Anty.**

B. Comité Asie Française **7** (1907): 197–207.

La mission Bons d'Anty.

Contains much information on the province of Hunan and its capital, Changsha.

Dutch East Indies. **Blink.**

Nederlandsch Oost- en West-Indië: geographisch, ethnographisch en economisch beschreven door Dr. H. Blink. Tweede Deel. Leiden: E. J. Brill, 1907. Size 10 × 7, pp. xii. and 586. *Price* 16*s.* 6*d.*

Dutch East Indies. **Serrurier.**

De Compagnie's Kamer van het Museum van het Bataviaasch Genootschap van Kunsten en Wetenschappen. (Door M. Serrurier.) Batavia, etc., 1907. Size 11½ × 9, pp. 14. *Illustrations.*

Describes the steps taken to fit up a hall with antique Eastern furniture, etc., as used in the old days of the Dutch East India Company.

India. ———

Annual report of the Board of Scientific Advice for India, 1905–6. Calcutta, 1907. Size 10 × 7, pp. vi., 172, and x. *Map.*

Contains some items of news regarding surveys, etc., outside India (cf. August number, pp. 212, 213).

India—Language. **Thimm.**

Hindustani grammar self-taught. By Captain C. A. Thimm. Second edition. London: Marlborough & Co., 1907. Size 7½ × 5, pp. 120. *Price* 2*s.* 6*d. Presented by the Publishers.*

This little book seems fairly good of its kind, though the *rationale* of Hindi idioms is not always so clearly explained as it might be. To give an instance quite at random, the phrase for "I have no knife" (to me knife [there is] not) is explained by the inadequate statement (p. 48) "verb *have* understood."

India—Language. **Wickremasinghe.**

Tamil self-taught, with English phonetic pronunciation. By M. de Zilva Wickremasinghe. London: E. Marlborough & Co., 1907. Size 7½ × 5, pp. 96. *Price* 2*s.* 6*d.* *Presented by the Publishers.*

India—North-West Frontier. ———

Selections from the Records of the Government of India, Foreign Department. No. 429. Foreign Department, Serial No. 164. Administration Report of the North-West Frontier Province for 1905–6. Calcutta, 1907. Size 13 × 8½, pp. iv., vi., and 44.

India—Population. **Mayr.**

Die Britisch-Indische Bevölkerung nach den Ergebnissen der Volkszählung von 1901. Von Georg v. Mayr. (Separat-Abdruck aus dem Allgemeinen Statistischen Archiv. vii. Band, Erster Halbband.) Tübingen, 1907. Size 9 × 6, pp. 265–329.

India—Surveys. **Longe.**

Extracts from Narrative Reports of the Survey of India for the season 1904–1905. Prepared under the direction of Colonel F. B. Longe. Calcutta, 1907. Size 13½ × 8½, pp. 128. *Presented by the Surveyor-General of India.*

Indo-China—Treaty. ———

France, No. I. (1907). Despatch from His Majesty's Ambassador at Paris, transmitting the Treaty between France and Siam, signed at Bangkok, March 23, 1907. London, 1907. Size 13 × 8½, pp. 12. *Price* 1½*d.*

See note in vol. **29**, p. 569.

Japan—Formosa. *Rev. Coloniale* (1907): 274–288. **Kann.**

Note concernant l'industrie du camphre à Formose. Par Réginald Kann.

Japan—Formosa. *J. College Sc., Tōkyō* **22** (1906): pp. 704. **Matsumura and Hayta.**

Enumeratio plantarum in Insula Formosa sponte crescentium hucusque rite cognitarum adjectis descriptionibus et figuris specierum pro regione novarum. By J. Matsumura and B. Hayta. *With Map and Plates.*

Japan—Formosa—Earthquake. **Omori.**

B. Imp. Earthquake Investigation Com. **1** (1907): 53–69.

Preliminary note on the Formosa earthquake of March 17, 1906. By Dr. F. Omori. *With Maps and Illustrations.*

Japan—Language. **Shand.**

Japanese self-taught, with English phonetic pronunciation. Edited by W. J. S. Shand. London: E. Marlborough & Co., 1907. Size 7½ × 5, pp. 108. *Price* 2*s.* 6*d.* *Presented by the Publishers.*

Likely to be useful to those desiring an elementary knowledge of Japanese.

Malay Archipelago—Sumatra. *Sitzungsb. K. Preuss. A.W.* (1907): 127–140. **Volz.**

Vorläufiger Bericht über eine Forschungsreise zur Untersuchung des Gebirgsbaues und der Vulkane von Sumatra in den Jahren 1904–1905. Von Prof. Dr. Wilhelm Volz.

Malay States—Geology. **Scrivenor.**

Federated Malay States. Geologist's report of progress, September, 1903, to January, 1907. By J. B. Scrivenor. Kuala Lumpur, 1907. Size 10 × 6, pp. x. and 44.

The latter half deals with economic geology.

Mongolia and Tibet. **Kozloff and Merezhkovski.**

Mongolia and Kham. The work of the Imperial Russian Geographical Society's Expedition, 1899–1901. Vol. **8.** Diatoms of Tibet, by K. S. Merezhkovski. [In Russian.] St. Petersburg, 1906. Size 12½ × 9, pp. 42. *Map. Presented by the Imperial Russian Geographical Society.*

Turkey. *Petermanns M.* **53** (1907): 145–153. **Schaffer.**

Grundzüge des geologischen Baues von Türkisch-Armenien und dem östlichen Anatolien. Von Dr. Franz X. Schaffer. *With Map.*

AFRICA.

Africa. **Keane.**

Stanford's Compendium of geography and travel (new issue). Africa: vol. i. North Africa. By A. H. Keane. 2nd edit. London: E. Stanford, 1907. Size 8 × 5, pp. xx. and 640. *Maps and Illustrations. Price* 15*s.* *Presented by the Publisher.*

Africa—Bantu. **Oordt.**

Cape of Good Hope. Colonial Secretary's Ministerial Division. The Origin of the Bantu. A preliminary study by J. F. Van Oordt. Cape Town, 1907. Size 9½ × 6, pp. vi. and 98.

See review in the August number (p. 202).

Africa—Communications. *R. Engineers J.* **5** (1907): 288–298. **Denison.**

Road Construction and Maintenance in Tropical Africa. By Lieut. G. W. Denison. *With Sections.*

Africa—Currencies. *M.G. Ges. Hamburg* **22** (1907): 1–34. **Kürchhoff.**

Die Geldverhältnisse im heutigen Afrika in ihrer Entwickelung. Von D. Kürchhoff.

Algeria. *Ann. G.* **16** (1907): 139–147. **Rousseau.**

Dans la basse vallée de l'Oued Sahel. Notes sur les Mezzaïa, les Toudja et les Beni Ourlis. Par Robert Rousseau.

Algeria. *B.R.S.G. Madrid* **49** (1907): 226–265. **Serrano.**

Relación de un viaje hecho desde Madrid á la ziudad de Argel para redimir cautivos en el año 1670. Por fray Bartolomé Serrano.

Algeria.

Statistique générale de l'Algérie, 1905. Algiers, 1906. Size 10½ × 7, pp. 326 and xx.

Algeria—Commerce. **Delorme.**

Exposition Coloniale de Marseille en 1906. Le commerce algérien (rapports avec la France et l'étranger). Par P. Delorme. 2 vols. Algiers, 1906. Size 9½ × 6½, pp. (vol. 1) viii. and 492; (vol. 2) 464 and lxiv.

Algeria—Geodesy. *C.R.A. Sc. Paris* **144** (1907): 792–795. **Bourgeois and Noirel.**

Sur la forme du géoide dans la région du Sahel d'Alger. Par Bourgeois et Noirel. *With Sketch-maps.*

British West Africa. *J.R. Colonial I.* **38** (1906–7): 360–379. **Montmorres.**

The Commercial Possibilities of West Africa. By Right Hon. Viscount Montmorres.

Canary Islands—Tenerife. **Espinosa.**

The Guanches of Tenerife; the Holy Image of Our Lady of Candelaria; and the Spanish conquest and settlement, by the Friar Alonso de Espinosa. Translated and edited, with notes and an introduction, by Sir Clements Markham. (Hakluyt Society publications, Second Series, No. xxi.) London, 1907. Size 9 × 5, pp. xxvi. and 222. *Maps and Facsimile Illustrations. Presented by the Hakluyt Society.*

Cape Colony—Bechuanaland. *P. Rhodesia Sc. Ass.* **6** (1906): 73–86. **Molyneux.**

A Contribution to the Geology of the Bechuanaland Protectorate. By A. J. C. Molyneux.

Cape Colony—Buffalo River. **Schwarz.**

The Rock Channel of the Buffalo River, East London. By E. H. L. Schwarz. (From the Records of the Albany Museum, vol. 2, No. 1.) Albany, 1907. Size 9½ × 6½, pp. 18. *Section. Presented by the Author.*

See note in the September number (p. 333).

Cape Colony—Irrigation. **Leane.**

Cape of Good Hope. Fish River Surveys. Report by Mr. W. B. Leane upon Proposed Schemes at Strydom's Kraal, Cradock, with covering letter by Mr. W. B. Gordon. Cape Town, 1906. Size 13 × 6, pp. 22. *Plan and Sections.*

Cape Colony—Irrigation. **Newman.**

Cape of Good Hope. Reports on the Great Fish, Bushmans, and Sundays Rivers. By Mr. R. W. Newman, 1905. Cape Town, 1906. Size 13 × 8, pp. 20. *Sections.*

On the possibilities of irrigation from these rivers.

Congo State. **Cornoldi.**

Aristide Cornoldi. La Questione Congolese. Milano, 1907. Size 10½ × 7½, pp. 64. *Map. Presented by the Società Italiana di Esplorazioni Geografiche e Commerciali.*

The writer, who occupied an official position in the north-east part of the state

under the agreement between the Italian and Congolese Governments, gives an impartial review of the history and present condition of the state, and points out the interests which he considers it to offer to Italy.

Congo State. *M.G. Ges. Hamburg* **22** (1907): 173–200. **Frobenius.**

Kolonialwirtschaftliches aus dem Kongo-Kassai-Gebiet. Einige Beobachtungen von Leo Frobenius.

East Africa. *P. Rhodesia Sc. Ass.* **6** (1906): 118–138. **Laessoe.**

The Lundi and Sabi Rivers. By H. de Laessoe. *With Maps and Illustrations.*

East Africa. **Seaman.**

Observations in the Tropics. By Louis L. Seaman. [Reprint from the *New York Medical Journal* for September 29, 1906.] A. R. Elliott. New York, 1906. Size 8 × 5½, pp. 8. *Presented by the Author.*

During a visit to East Africa, the author paid special attention to disease and its treatment.

Egypt. **Cromer.**

Egypt. No. 2 (1907). Despatch from the Earl of Cromer respecting the water-supply of Egypt. London, 1907. Size 13 × 8½, pp. 18. *Price* 2½*d.*

See note in the Monthly Record for September (p. 332).

Egypt. ———

Survey Department, Egypt. Meteorological Report for the year 1904. Part ii. Climatological Stations, Rainfall, and River Gauge Observations. Cairo, 1906. Size 14½ × 10½, pp. x. and 46.

NORTH AMERICA.

Alaska—Bogoslof Islands. *Popular Sc. Monthly* **69** (1906): 481–489. **Jordan and Clarke.**

The Bogoslofs. By David Starr Jordan and George Archibald Clarke. *With Illustrations.*

See note in the *Journal* for February, 1907, p. 228.

Alaska—Commercial. *National G. Mag.* **18** (1907): 164–190. **Brookes.**

Railway routes in Alaska. By Alfred H. Brookes. *With Maps, Illustrations, and Diagrams.*

Alaska—Nome. *America J. Sc.* **23** (1907): 457–458. **Dall.**

On climatic conditions at Nome, Alaska, during the Pliocene, and on a new species of Pecten from the Nome Gold-bearing Gravels. By William Healey Dall, Paleontologist U.S. Geol. Survey. *With Illustration.*

America—Cartography. *B. American G.S.* **39** (1907): 202–224. **Stevenson.**

Typical early maps of the New World. By E. L. Stevenson. *With Facsimiles.*

Canada. *J.R. Col. I.* **38** (1907): 439–465. **Griffith.**

Some phases of Canada's development. By W. L. Griffith.

Canada—Geological Survey. ———

Summary Report of the Geological Survey Department of Canada for the Calendar Year 1906. Ottawa. Size 9½ × 6½, pp. vi. and 206. *Presented by the Geological Survey of Canada.*

See note in the Monthly Record for August (p. 215).

Canada—Glaciers. *P.A. Nat. Sc., Philadelphia* **63** (1906): 568–580. **Vaux.**

Observations made in 1906 on glaciers in Alberta and British Columbia. By George and William S. Vaux. *With Map and Illustrations.*

Canada—Nova Scotia. *P. and T. Nova Scotian I. Sc.* **11** (1903–04): 264–270. **McIntosh.**

The question of subsidence at Louisberg, Cape Breton. By Kenneth McIntosh.

Canada—Tides. ———

Tide tables for the Pacific Coast of Canada, 1907 . . . Ottawa, 1609. Size 9½ × 6½, pp. 28.

Mexico—Geology. *Science* **25** (1907): 710–712. **Hill.**

Geology of the Sierra Almoloya, with notes on the tectonic history of the Mexican plateau. By Robert T. Hill.

Noticed in the Monthly Record (July, p. 93).

Mexico—Volcanoes. *Scottish G. Mag.* **23** (1907): 281–312. **Cadell.**

Some old Mexican volcanoes. By Henry M. Cadell. *With Maps and Illustrations.*

North America—Ethnology. **Hodge.**

Smithsonian Institution: Bureau of American Ethnology, Bulletin 30. Handbook of American Indians north of Mexico. Edited by Frederick Webb Hodge. Part i. Washington, 1907. Size 9½ × 6, pp. x. and 972. *Map and Illustrations.*

United States. **Johnson.**

Report on the Geological Excursion through New Mexico, Arizona, and Utah, summer of 1906. By Douglas Wilson Johnson. (Reprinted from *Technology Quarterly*, vol. 19, No. 4, December, 1906.) Size 10½ × 7, pp. 408–415.

United States—Florida. **Millspaugh.**

Field Columbian Museum Publs., Botanical Ser. **2** (1907), 189–246.

Flora of the Sand Keys of Florida. By Charles Frederick Millspaugh. *With Maps.*

Noticed in the Monthly Record.

CENTRAL AND SOUTH AMERICA.

Argentine—Archæology. **Ambrosetti.**

Exploraciones arqueológicas en la Pampa grande (Provincia de Salta). Por Juan B. Ambrosetti. (De la *Revista de la Universidad de Buenos Aires*, 1906, Tomo v.) Buenos Aires, 1906. Size 10½ × 7, pp. 200. *Maps and Illustrations.*

Argentine—Levelling. **Lelli.**

An. S. Cient. Argentina **62** (1906): 137–152, 202–208, 243–250.

La nivelación de precisión en la República Argentina. Por Aduino Lelli.

Argentine—Patagonia. **Ameghino.**

Ann. Museo Nacional, Buenos Aires **8** (1906): pp. 568.

Les formations sédimentaires du crétacé supérieur et du tertiaire de Patagonie. Par Florentino Ameghino. *With Illustrations.*

Bolivia. **Neveu-Lemaire.**

Mission scientifique G. de Créqui Montfort et E. Sénéchal de la Grange. Les lacs des hauts plateaux de l'Amérique du Sud. Par le Dr. M. Neveu-Lemaire. Paris: H. le Soudier, 1906. Size 11 × 7½, pp. vi. and 198. *Maps and Illustrations. Price 7.50 fr. Presented by the Publisher.* [To be reviewed.]

Bolivia. **Calderon.**

Bolivia. Address delivered by Mr. Ignacio Calderon . . . Washington, 1907. Size 9 × 6, pp. 22. [In Spanish and English.]

On the development and present condition of Bolivia.

Brazil. *J. Geology* **15** (1907): 218–237. **Derby.**

The sedimentary belt of the coast of Brazil. By Dr. Orville A. Derby. *With Sketch-map.*

Brazil—Amazon. *Ann. G.* **16** (1907): 159–174. **Le Cointe.**

Notice sur la carte du cours de l'Amazone et de la Guyane brésilienne depuis l'océan jusqu'à Manaos. Par Paul Le Cointe. *With Map.*

The map—on the scale of 1: 2,000,000—is an attempt to correlate the results of all previous journeys with the author's own observations.

Chile and Argentina—Boundary. **Patron.**

Republica de Chile: Oficina de Limites. La linea de frontera con la República Arjentina entre las latitudes 27° i 31° S. Por Luis Riso Patron S. Santiago de Chile, 1907. Size 11 × 8, pp. 190. *Maps and Illustrations. Presented by the Oficina de Límites, Chile.*

Peru. **Clairmont.**

Guide to modern Peru: its great advantages and unique opportunities. By A. de Clairmont. Toledo, Ohio, 1907. Size 7½ × 5½, pp. 80. *Illustrations. Presented by the Author.*

Peru. **Enock.**

The Andes and the Amazon: life and travel in Peru. By C. Reginald Enock. London: T. Fisher Unwin, 1907. Size 9 × 5½, pp. xvi. and 380. *Map and Illustrations. Price 21s. Presented by the Publisher.* [To be reviewed.]

AUSTRALASIA AND PACIFIC ISLANDS.

New Guinea—British.

British New Guinea. Annual report for the year ending June 30, 1906. Melbourne, 1907. Size 13 × 8½, pp. 94. *Sketch-maps and Illustrations.*

New Guinea—Dutch. *Ts. K. Nederlandsch Aard. Genoots.* **24** (1907): 466–471. **Lorentz.**

De Nieuw-Guinea Expeditie van de "Maatschappij ter Bevorderung van het Natuurkundig Onderzoek der Ned. Kolonien," en het "Indisch Comité voor Wetenschappelijke Onderzoekingen." Door H. A. Lorentz.

Describes the organization and plans of this expedition, which lately left Batavia for the south coast of Dutch New Guinea.

Pacific Islands. **Elkington.**

The savage South Seas; painted by Norman H. Hardy; described by E. Way Elkington. London: A. & C. Black, 1907. Size 9 × 6, pp. xii. and 212. *Illustrations. Price 20s. net. Presented by the Publishers.*

See Review, *ante*.

Pacific Ocean. *National G. Mag.* **18** (1907): 205–208. **Hague.**

A Recent Report from the "Doubtful Island Region." By James D. Hague. *With Maps.*

The existence of a reef in the north-east Pacific (cf. *Journal*, vol. **25**, p. 331) was reported by the commander of the French barque *Michelet* early in the present year.

Samoa—Savaii. *M.k.k.G. Ges. Wien* **50** (1907): 28–37. **Rechlinger.**

Ausflug zu dem neuentstandenen Krater auf der Insel Savaii (Samoa) im August 1905. Von Dr. Karl und L. Rechlinger.

Western Australia—Zoogeography. *M.G. Ges. Hamburg* **22** (1907): 35–68. **Michaelsen.**

Die Tierwelt Südwest-Australiens und ihre geographischen Beziehungen. Von Dr. W. Michaelsen. *With Sketch-maps.*

Western Australia. *J.R. Col. I.* **38** (1907): 275–294. **Rason.**

The Resources of Western Australia. By Hon. C. H. Rason.

POLAR REGIONS.

Antarctic. **Nordenskiöld and others.**

Wissenschaftliche Ergebnisse der schwedischen Südpolar-Expedition, 1901–1903, unter Leitung von Dr. Otto Nordenskiöld. Band IV. Lieferung 5 (pp. 16); Lieferung 6 (pp. 172); and Band V. Lieferung 9 (pp. 22). Stockholm, 1906–7. Size 11 × 8½. *Map and Plates.*

These parts deal with the collections of marine algæ, collembola, etc.

Antarctic—Belgian Expedition. **Arctowski.**

Plan de voyage de la Second Expédition Antarctique Belge. Par Henryk Arctowski. Vanderauwera & Co., Bruxelles, 1907. Size 9 × 6, pp. 16.

Antarctic—Belgian Expedition. **Arctowski.**

Programme Scientifique de la Seconde Expédition Antarctique Belge. Par Henryk Arctowski. Bruxelles: Ferdinand Larcier, 1907. Size 9½ × 6, pp. 16.

Antarctic—Geology.

National Antarctic Expedition, 1901–1904. Natural History. Vol. 1. Geology (Field-geology: petrography). London, 1907. Size 12½ × 9, pp. xii. and 160. *Maps and Illustrations. Price 30s. Presented by the British Museum (Natural History).*

Arctic. *La G., B.S.G. Paris* **15** (1907): 233–252. **Amundsen.**

Vers le Pôle magnétique boréal par le passage du Nord-Ouest. Par Roald Amundsen.

Arctic. *B. American G.S.* **39** (1907): 224–231. **(Mikkelsen and Stefansson.)**

(Letters from Captain Einar Mikkelsen and V. Stefansson.) *With Map.*

Arctic—Norwegian Expedition. **Isachsen.**

Report of the Second Norwegian Arctic expedition in the *Fram*, 1898–1902. No. 5. Astronomical and Geodetical Observations. By Gunnar Isachsen. Christiania, 1907. Size 11 × 7, pp. 142. *Maps and Illustrations.*

MATHEMATICAL GEOGRAPHY.

Astronomy—Moon. *C.R.A. Sc. Paris* **144** (1907): 1193–1196. **Loewy and Puiseux.**
Sur l'origine des accidents du sol lunaire. Par Loewy et Puiseux.

Cartography—Historical. *Rev. G. Col. y Mercantil* **4** (1907): 155–159. **Blázquez.**
Tres cartas nauticas del siglio xvi. Por A. Blázquez.

These charts, one of which embraces the basin of the Mediterranean with the west coasts of Spain and Morocco, the others portions of the same area on a larger scale, seem to show a connection with the order of St. John of Jerusalem.

Cartography—Statistical Maps. **Mayr.**
Zur Methodik und Technik statistischer Karten. Von Dr. Georg v. Mayr. (Separat-Abdruck aus dem Allgemeinen statistischen Archiv, VII. Band, Erster Halbband.) Tübingen, 1907. Size 9 × 6, pp. 131–157.

Geodesy. **McCaw.**
The Progress of Geodesy. By G. T. McCaw. (Read before the Institution of Civil Engineers of Ireland, May 1, 1907.) Dublin, 1907. Size 8½ × 5½, pp. 42. *Map and Illustrations. Presented by the Author.*

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Climatology. *J.G.* **5** (1906): 302–319, 339–353, 395–405, 433–450. **Ward.**
The Characteristics of the Zones. By Robert De C. Ward. *With Maps and Diagrams.*

Coasts. *J.S. Arts* **55** (1907): 650–667. **Carey.**
The Protection of Sea-shores from Erosion. By Alfred Edward Carey. *With Illustrations and Diagrams.*

Coasts. *C.R.A. Sc. Paris* **144** (1907): 938–940. **Thoulet.**
Sur la marche des sables le long des rivages. Par Thoulet.

Erosion. *Atti R.A. Lincei, Rendiconti, Ser.* v. **16** (1907), 1 *Sem.*, 571–575. **Fischer.**
Fenomeni di abrasione sulle coste dei paesi dell' Atlante. Di Teobaldo Fischer.

Erosion. *P.R.S. Victoria* **19** (1907): 54–59. **Leach.**
Surface tension as an aid in canyon formation, the production of bad lands, and in river capture. By J. A. Leach. *With Diagrams.*

The writer holds that the tendency of water to adhere to surfaces is an important factor in processes of erosion, as it helps the wearing away of softer layers of rock or soil by undercutting.

Geomorphology. **Götzinger.**
G. Abhandlungen (Penck) **9** (1907): Heft 1, pp. iv. and 174.
Beiträge zur Entstehung der Bergrückenformen. Von D. Gustav Götzinger. *With Maps, Diagrams, and Illustrations.*

Geomorphology—Erosion. *C.R.A. Sc. Paris* **144** (1907): 936–938. **Brunhes.**
Sur les relations entre l'érosion glaciaire et l'érosion fluviale. Par Jean Brunhes.

Geophysics. *P.R.S.* **79** (1907): *Ser. A.*, 194–199. **Love.**
The gravitational stability of the earth. By A. E. H. Love.

Historical—Travel. **Adler.**
The Itinerary of Benjamin of Tudela. Critical text, translation, and commentary by Marcus Nathan Adler. London: H. Frowde, 1907. Size 9 × 5½, pp. xvi., 94, and [100]. *Map and Facsimiles. Price 5s. net. Presented by the Publisher.*

This is not merely an English version of the edition reviewed in vol. **27**, p. 83, in which Dr. Adler's name appears as joint editor with that of Dr. Grünhut of Jerusalem. The translation and notes are here the work of Dr. Adler alone. The edition will prove of great use to students, and, while not intended to supplant the standard work of Asher, it is valuable as presenting the results of more recent research.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Anthropogeography—Climate and Man. **Tyler.**
The psycho-physical aspect of climate, with a theory concerning intensities of sensation. By W. F. Tyler. (Reprinted from the *Journal of Tropical Medicine*

and Hygiene, April 15, 1907.) London, 1907. Size 9½ × 6, pp. 46. *Diagrams. Presented by the Author.*

Anthropogeography—Migrations. *J. Anthropological I.* **36** (1906): 189–220. **Petrie.**
Migrations. By Prof. W. M. Flinders Petrie. *With Maps and Illustrations.*

BIOGRAPHY.

Dapper—Bibliography. **Schuller.**
Novus Orbis. De A. Montanus o de O. Dapper? Por R. R. Schuller. [Santiago, N.D.] Size 9½ × 6, pp. 18. *Facsimiles. Presented by the Author.*

The writer lays it down that Montanus was but a pseudonym of Dapper. (See note in the Monthly Record, November, p. 568.

Fanshawe. **Fanshawe.**
The memoirs of Ann Lady Fanshawe, wife of the Right Honourable Sir Richard Fanshawe, Bart., 1600–72, reprinted from the Original Manuscript in the possession of Mr. Evelyn John Fanshawe of Parsloes, with four photogravure portraits and twenty-nine other reproductions. London: John Lane, 1907. *Presented by the Editor.*

The editor, Mr. H. C. Fanshawe, supplies copious notes embodying all the fresh information he has been able to glean concerning Sir Richard Fanshawe and his wife. The memoirs are occasionally of geographical interest, as they describe various journeys, including that from Cadiz to Madrid made at the time of Sir Richard's appointment as ambassador to the court of Spain.

GENERAL.

British Colonies. ———
Emigration: Memorandum on the History and Functions of the Emigrants' Information Office. 1907. London, 1907. Size 13 × 8½, pp. 10. *Diagrams. Price 6d.*

Includes statistics on emigration to the colonies.

British Empire. **Hearnshaw.**
The Empire and the Schools. By F. J. C. Hearnshaw. (From the *School World*, June, 1907.) London, 1907. Size 10½ × 7½, pp. 204–208.

Contains a useful bibliography of school books on the British Empire.

British Empire. ———
Minutes of Proceedings of the Colonial Conference, 1907. London, 1907. Size 13½ × 8½, pp. x. and 622. *Price 5s.*
Papers laid before the Colonial Conference, 1907. London, 1907. Size 13 × 8½, pp. x. and 592. *Price 4s. 9d.*

Educational. **Das.**
The Modern Geography. No. 1 (for beginners). By B. B. Das. Third edit. Calcutta, 1905. Size 7 × 5, pp. 68. *Maps. Presented by the Author.*

Consists mostly of lists of names, etc., with slight attempt at explanation of phenomena.

Educational. **Gibbs.**
The Pedagogy of Geography. By David Gibbs. (Reprinted from the *Pedagogical Summary*, March, 1907, vol. 14. Size 9½ × 6, pp. 39–100.) *Presented by the Author.*

NEW MAPS.

By E. A. REEVES, *Map Curator*, R.G.S.

EUROPE.

England and Wales. **Ordnance Survey.**
Sheets published by the Director-General of the Ordnance Survey, Southampton, from October 1 to 31, 1907.

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Carmarthenshire, 29 N.W., S.W., 31 N.W., 34 S.E., 37 N.E., S.E., 38 S.W., S.E., 39 N.W., S.E., 40 N.E., S.W., S.E., 41 S.E., 42 N.E., S.W., S.E., 44 N.E., 45 N.E., S.E., 46 N.W., N.E., 53 N.E. **Cornwall,** 11 N.W., 15 N.E., S.W., 16 S.W., S.E., 21 N.W., N.E., 27 N.E., 36 N.E., 37 N.W., N.E., S.W., 39 S.E., 44 N.W., N.E., S.E., 45 N.E., S.W., 53 N.E., 54 N.E. (54 S.E. and 55 S.W.), 55 N.W. **Devonshire,** 117 S.E., 123 (S.W. and S.E.). **Lincolnshire,** 25 N.W., N.E., S.W.,'28 N.W., 30 S.W., 31 N.W., 37 N.W. **Norfolk,** 41 S.W. **Pembrokeshire,** 6 N.W., 12 S.E., 13 N.W. **Yorkshire (First Revision of 1891 Survey),** 262 S.W., 264 N.E., 265 N.E. 1*s. each.*

25-inch—County Maps:—

Cornwall (First Revision), XLVII. 16; LVI. 12; LVII. 5, 6, 7, 8, 9, 10, 11, 12; LVIII. 9, 10, 13, 16; LIX. 13, 14, 16; LXIV. 3, 4, 6, 8, 10, 12; LXV. 1, 2, 4, 5, 6, 8, 9, 12, 13; LXVI. 1, 3, 6; LXXX. 5, 6, 7, 8 (10 and 9), 11, 12, 14, 15, 16; LXXXI. 5, 6, 7, 8, 9, 10, 11 (12 and 16), 13, 14, 15 (16 and 12); LXXXIV. 2, 3, 4, 6, 7, 8, 11, 12, 15, 16; LXXXV. 1, 2 (3, 6, and 7), (5 and 9), (6, 7, and 3), (9 and 5). **Kent** (Second Revision), XXIV. 15; XXXV. 4, 15; XLIV. 8, 12, 16; XLV. 5, 9, 13; XLVI. 2, 5; LIV. 4, 6, 7, 8, 10, 11, 12; LV. 1, 5, 9, 15, 16; LVI. 13; LXV. 2, 4, 12, 16; LXVI. 5, 9, 13; LXVIII. 5; LXXIII. 4. 8*s. each.* **Lancashire (First Revision of 1891 Survey),** CI. 12; CII. 1, 2, 4, 5, 6, 8; CVIII. 14; CX. 4. **Lincolnshire** (First Revision), IX. 8, 14, 15; X. 2, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 16; XI. 1, 6, 7, 8, 10, 11, 12, 14, 15; XIII. 15, 16. **Norfolk** (First Revision), L. 16; LI. 13, 14; LXII. 12; LXIV. 6, 7, 8, 10, 11, 12, 14, 15, 16; LXV. 9, 13; LXXIV. 4; LXXV. 2; LXXVI. 1, 2, 3, 4; LXXVII. 1, 14. **Pembrokeshire** (First Revision), IV. 10; VIII. 12; XV. 2, 3, 9, 10, 11, 12, 13, 14, 15, 16; XVI. 7, 9, 13, 14, 15, 16; XXI. 3, 7, 8; XXII. 1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16; XLI. 12. **Yorkshire** (First Revision of 1891 Survey), CCXXIX. 8, 15; CCXXX. 2, 3, 4, 5, 6, 7, 9, 10, 12, 14; CCXXXI. 14; CCXXXVI. 1, 2, 3, 7, 9, 10.

(*E. Stanford, London Agent.*)

England and Wales. **Geological Survey**

4 miles to 1 inch:—

New series, solid edition, printed in colours. Sheets: (1 and 2) Alnwick, Berwick-on-Tweed, etc.; 3, Carlisle, Keswick, and Isle of Man (part of); 4, Newcastle-upon-Tyne, Stockton, etc.; 7, Leeds, Manchester, and York. 2*s.* 6*d. each.*

6-inch—Maps, uncoloured:—

Staffordshire, 13 N.W., 19 N.W., N.E., S.W. 1*s.* 6*d. each.*

(*E. Stanford, London Agent.*)

France. **Ministre de l'Intérieur, Paris.**

Carte de la France dressée par ordre du Ministre de l'Intérieur. Scale 1:100,000 or 1 inch to 1·6 stat. mile. Sheets: xiv.–19, Amboise; xvi.–14, Dourdan; xix.–17, Auxerre; xxiii.–12, Verdun; xxiv.–34, Salernes; xxv.–17, Luxeuil. New editions. Paris: Ministère de l'Intérieur, Service Vicinal, 1907. *Price* 0.80 *fr. each sheet.*

Germany. **Vogel.**

Karte des Deutschen Reichs. Unter Reduktion von Dr. C. Vogel, ausgeführt in Justus Perthes Geographischer Austalt in Gotha. Scale 1:500,000 or 1 inch to 7·9 stat. miles. 27 sheets. Gotha: Justus Perthes, 1907.

A new edition of a map that first appeared in 1891.

Portugal. **Direcção Geral dos Trabalhos Geodesicos e Topographicos.**

Carta de Portugal. Scale 1:50,000 or 1·3 inch to 1 stat. mile. Sheets: 16–*d*, Constancia; 17–*b*, Cadaval; 17–*c*, Santarem. Lisbon: Direcção Geral dos Trabalhos

Geodesicose Topographicos. *Price* 300 *reis per sheet. Presented by the Direcção Geral dos Trabalhos Geodesicos e Topographicos, Lisbon.*

Three additional sheets of the new Government survey of Portugal. Contour-lines, in brown, are given at intervals of 25 metres; roads in red, water blue and wooded lands green. Altogether the map is being most satisfactorily produced, and is very clear and effective. The present sheets include Santarem and the districts immediately to the west and north-east. Six sheets of the survey have now been published, the three others comprising the neighbourhood of Aveiro.

ASIA.

Armenia. **Oswald.**

A geological map of Armenia and its border-ranges, with indications of minerals and mineral springs. Drawn and hand-coloured by Felix Oswald, D.SC., F.G.S. Scale 1 : 1,013,760 or 1 inch to 16 stat. miles. London: Dulau & Co., 1907. *With Explanatory Notes.*

Dr. Felix Oswald accompanied Mr. H. F. B. Lynch on his second journey through Turkish Armenia in 1898, with the object of investigating the physical geography and geology of the country, and this geological map gives the generalized results of his researches and observations. The map is accompanied by a pamphlet of sixteen pages of explanatory notes; but the fuller 'Treatise on the Geology of Armenia,' which was published by the author last year, and was accepted by the University of London for the degree of Doctor of Science, gives the details of Dr. Oswald's investigations, and is accompanied by numerous diagrams and maps. The above map, which may be considered as a supplement to the work just referred to, contains a large amount of detailed information. In its production other authorities have been consulted, and these are all mentioned in the title. The map is a photo-lithographic facsimile of the author's own drawing, coloured by hand, so it has a somewhat unprofessional appearance; but the information contained is most valuable. Only a few copies have been printed off.

Persia and Afghanistan. **Topographical Section, General Staff.**

Persia and Afghanistan. Scale 1 : 4,055,040 or 1 inch to 64 stat. miles. London: Topographical Section, General Staff, War Office, 1906. *Price* 2*s.* 6*d. Presented by the Director of Military Operations.*

This is a good general map of Persia, Afghanistan, and Baluchistan, with the neighbouring parts of Russian Turkestan and India, showing height of land by means of approximate contours and colour tinting. Land from sea-level to 500 feet is left white, after which follow nine tints of buff and brown, increasing in intensity with the altitude, and ranging from intervals of 500 feet to 5000 feet up to over 20,000 feet. Only the names of important places are given, and the map is not obscured by unnecessary detail, so that the tinting is effective, and clearly indicates at a glance the general relief of the region. Special attention has been paid to railways, roads, and telegraphs, and in connection with the former the gauge is indicated by the symbol employed.

AFRICA.

Algeria. **Jonnart.**

Algérie Nord. Carte dresée par ordre de M. Jonnart, Gouverneur-Général de l'Algérie. Scale 1 : 800,000 or 1 inch to 12·6 stat. miles. 2 sheets. Esquisse du Sahara Algérien. Carte dressée par ordre de M. C. Jonnart, Gouverneur Général de l'Algérie. Scale 1 : 2,500,000 or 1 inch to 39·5 stat. miles. Algiers: Gouvernement Général de l'Algérie, 1907. *Presented by the British Consul, Algiers.*

These are two outline maps, without hill features, showing clearly the limits of departments, communes, and other territorial divisions. The location of tribes is also a special feature, whilst the principal routes, railways, wells, and watercourses are indicated.

Dahomey. **Service Géog. de l'Afrique Occidentale Française, Paris.**

Carte du Bas-Dahomey. Scale 1 : 100,000 or 1 inch to 1·6 stat. mile. Sheet 1. Grand Popo. Paris: Service Géographique du Gouvernement Général de l'Afrique Occidentale Française, 1907. *Price* 1.50 *fr. each sheet.*

The provisional issue of the south-west sheet of a new French official map, compiled from route traverses, railway surveys, and other information. When complete, the map will con-ist of eight sheets.

Egypt. **Survey Department, Cairo.**

Topographical map of Fayum Province. Scale 1 : 10,000 or 6·3 inches to 1 stat.

mile. Sheet: S.W. 16–3. Cairo: Survey Department, 1907. *Presented by the Director-General, Survey Department, Cairo.*

German East Africa. **Sprigade and Moisel.**

Karte von Deutsch-Ostafrika. Begonnen unter Leitung von Dr. Richard Kiepert, fortgesetzt unter Leitung von Paul Sprigade und Max Moisel. Scale 1:300,000 or 1 inch to 4·7 stat. miles. Sheet: C 2, Rutschugi-Posten. Berlin: Dietrich Reimer, 1906. *Presented by the Publisher.*

Gold Coast. **Guggisberg.**

Map of the Gold Coast. Published by the authority of Sir John Pickersgill Rodger, K.C.M.G., Governor, under the direction of Major F. G. Guggisberg, R.E., F.R.G.S., Director of Surveys, Gold Coast. Scale 1:125,000 or 1 inch to 1·9 stat. mile. Sheets: 72–L–IV., Komfrodua; 72–Q–IV., Cape Coast; 72–R–I., Nsaba; 72–R–III. and 72–R–IV., Winneba and Nianyano. Edinburgh and London: W. & A. K. Johnston, 1907. *Price 2s. each sheet. Presented by Major F. G. Guggisberg, R.E., Director of Surveys, Gold Coast.*

South Africa. **Bartholomew.**

Bartholomew's reduced survey map of South Africa, coloured to show height of land. Scale 1:2,500,000 or 1 inch to 39·5 stat. miles. Edinburgh: John Bartholomew & Co., [1907]. *Price 3s. Presented by the Publisher.*

This is a new edition, with railways revised and corrected to date.

AMERICA.

Brazil. **Commissão Geographica e Geologica de S. Paulo.**

Topographical map of the State of Sao Paulo. Scale 1: 100,000 or 1 inch to 1·5 stat. mile. Sheets: Atibai, Botucatu, Campinas, Casa Branca, Jahu, Pindamonhangaba, Pirassununga, Rio Claro, S. Carlos do Pinhal, S. Paulo, S. Roque. Sao Paulo: Commissão Geographica e Geologica, 1906–1907. *Presented by the Geographical and Geological Commission of the State of Sao Paulo.*

With the exception of the "S. Roque" sheet, these are new editions of the sheets noticed in the *Geographical Journal* for April, 1906. Contour-lines in brown show altitudes at intervals of 25 metres, water is in blue, and roads, railways, and lettering black.

Canada. **Dept. of the Interior, Ottawa.**

Sectional map of Canada. Scale 1:190,080 or 1 inch to 3 stat. miles. Sheet: Prince Albert South, revised to September 4, 1907. Ottawa: Department of the Interior, Topographical Surveys Branch, 1907. *Presented by the Department of the Interior, Ottawa.*

Canada. **Dept. of Agriculture, Ottawa.**

Maps of Alberta, Manitoba, and Saskatchewan, showing population according to the censuses of 1901 and 1906. Sale 1: 792,000 or 1 inch to 12·5 stat. miles. Ottawa: Department of Agriculture, 1907. *Presented by James White, Esq., Geographer, Department of Agriculture.*

From an inspection of these maps a better idea of the rapid increase in the population of the provinces of Manitoba, Saskatchewan, and Alberta can be obtained than would be possible in a much longer time by consulting tables of statistics. Upon the maps are shown, in addition to general geographical features, the limits of the numerous townships, and in each of these clear figures in blue and red indicate the population according to the censuses of 1901 and 1906 respectively. The population of the cities, towns, villages, and electoral divisions is shown in each case by tables, as insets, and these figures are not included in those given on the maps themselves. Mr. White may be congratulated upon the production of these maps, which should be most useful and instructive. They are not obscured by unnecessary detail, and no hill-shading is given.

Chili. **Oficina de Limites, Santiago.**

Comision Chilena de Limites. Scale 1: 250,000 or 1 inch to 3·9 stat. miles. Sheets: Atacama and Llanquihue. Santiago: Oficina de Limites, 1907. *Presented by the Oficina de Limites, Santiago.*

The "Atacama" sheet includes the area between lat. 26° to 27° S. and long. 67° 30′ to 69° 20′, and shows the Salar de Pedernales, Salar de Maricunga, and Salar de Antofaya, while the Llanquihue sheet embraces the Rio Aisen, Rio Simpson, and Laguna Blanca region, extending from lat. 45° to 46° S., and from long. 70° 30′ to 73° W. As before, each topographical sheet is accompanied by another on the same

scale, showing the traverse lines and intersected points upon which the survey depends.

Newfoundland. **Howley.**

Geological map of Newfoundland, compiled from the most recent and authentic sources by James Howley, F.G.S., Director of the Geological Survey of Newfoundland. Scale 1 : 443,520 or 1 inch to 7 stat. miles. St. Johns: Geological Survey of Newfoundland, 1907. *Presented by James Howley, Esq.*

This map measures 60 × 53 inches, and clearly indicates the leading geological features of the island by the usual system of colouring, as well as the location of minerals, which are shown by symbols and letters. As many areas of the island are still very imperfectly known geologically, it is quite possible that in time to come considerable modifications and alterations will be found necessary, but for the present this will prove a most useful map.

GENERAL.

World. **Harmsworth.**

Harmsworth Atlas and Gazetteer. 500 maps and diagrams, and 105,000 references. Parts 26 and 27. London: The Amalgamated Press, Ltd., 1907. *Price 7d. each part.*

These parts contain the following maps: Part 26, Nos. 53–54, Scotland; 105–106, Asia Minor and Armenia; 203–204, Queensland. Part 27, Nos. 63–64, Western Switzerland; 161–162, Upper Canada; 209–210, New Zealand.

World. **Schrader.**

L'Année Cartographique. Supplément annuel a toutes les publications de géographie et de cartographie, dressé et rédigé sous la direction de F. Schrader. Dix-septième année contient les modifications géographiques et politiques de l'année, 1906. Paris: Hachette et Cie, 1907. *Price 3 fr. Presented by the Publisher.*

This year's issue of Schrader's 'l'Année Cartographique' is similar in appearance and general arrangement to those of earlier years. It consists of three sheets, the first of which is devoted to Asia, the second to Africa, and the third to America and the North Polar region. Each of these consist of a series of maps, with text on the back, dealing with the principal geographical explorations and boundary delimitations during the year 1906, among the more important being Major C. D. Bruce's journey from Leh to Peking, A. F. Stahl's routes in Persia, the finally arranged boundary between Northern Nigeria and French Sudan, and Captain Amundsen's remarkable voyage through the North-West Passage.

World. **Sipman**

Globus-Karte. Weltkarte in Teilkarten in einheitlichen Flachenmasstabe mit einer statistischen Tabelle der selbstandigen Staaten und der deutschen Kolonien entworfen und herausgegeben von Hauptmann Sipman. Berlin: Dietrich Reimer (Ernst Vohsen), 1907. *Price 1 m. Presented by the Publisher.*

As stated in the title, this is a map of the world in sections, on an equal-area projection. The sections, of which there are six in number, each embracing sixty degrees of longitude, have much the appearance of gores of a globe, but instead of the circles of latitudes being curved, they are shown by straight lines parallel with the equator, and at equal distances apart. Along the parallels the value of each ten degrees of longitude is marked off, and through these points pass the meridians, three on each side of the central meridian of each section. The result is an equal-area projection; but it is difficult to see what special advantage it possesses, and in the northern and southern regions numerous overlaps and duplications fill up the spaces between the wedge-shape gores, tending to confusion rather than serving any useful purpose.

CHARTS.

Indian Ocean and Red Sea. **Meteorological Office.**

Monthly meteorological chart of the Indian Ocean north of 15° S. lat. and Red Sea, November, 1907. London: Meteorological Office, 1907. *Price 6d. each. Presented by the Meteorological Office.*

North Atlantic and Mediterranean. **Meteorological Office.**

Monthly meteorological chart of the North Atlantic and Mediterranean, November, 1907. London: Meteorological Office, 1907. *Price 6d. each. Presented by the Meteorological Office.*

North Atlantic. **U.S. Hydrographic Office.**

Pilot chart of the North Atlantic ocean, October, 1907. Washington: U.S. Hydrographic Office, 1907. *Presented by the U.S. Hydrographic Office.*

North Pacific. **U.S. Hydrographic Office.**

Pilot chart of the North Pacific ocean, November, 1907. Washington: U.S. Hydrographic Office, 1907. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

Asia Minor and Persia. **Douglas.**

Seventy-nine photographs of Asia Minor and Persia, taken by Lieut.-Colonel J. A. Douglas, I.A. *Presented by Lieut.-Colonel J. A. Douglas.*

Colonel J. A. Douglas' interesting series of photographs include Trebizond, on the Black sea, Tehran, thence south and east through Persia to Isfahan, the Bakhtiari country, and Seistan. The following are the titles:—

(1 and 2) Trebizond; (3 and 4) Kerasunda; (5) Ineboli; (6) Riva; (7) In the Black sea; (8 and 9) Deck passengers on steamer in the Black sea; (10) A street in Tehran; (11) The British Legation at Tehran; (12) In the bazaar at Tehran; (13) Dr. Sven Hedin at Tehran; (14 and 15) In the hills near Tehran; (16) A camp in the hills near Tehran; (17) In the hills near Tehran, looking south from the Kandevan pass; (18–21) In the Lar valley near Tehran; (22 and 23) Persian nomads in the Lar valley, milking sheep; (24 and 25) Persian nomads in the Lar valley, churning milk; (26 and 27) In the Legation garden at Gulahek; (28) The cone of Mount Demavend; (29) In the Mazanderan hills; (30) Pass on the Kazvin-Hamadan road; (31) Ab-i-zarin; (32) A midday halt; (33) Persia women travelling; (34) A Persian merchant; (35) A family removal; (36) A travelling carriage in North Persia; (37) The Maidan at Isfahan; (38) Bridge at Isfahan; (39) Prince Bahrain Mirza at Isfahan; (40) A travelling carriage on the road to Isfahan; (41) Mosque at Kum; (42 and 43) The old bridge at Shuster; (44) Crossing the Karun on a skin-raft at Shuster; (45) A steamer on the Karun; (46) Old bridge at Dizful; (47) The British Consulate General at Meshed; (48) In the desert of East Persia; (49) Ahingaran gorge, East Persia; (50) Village of Duruh; (51) A village scene in East Persia; (52) A camp in East Persia; (53) Guard of Persian soldiers; (54) Persian soldiers drilling; (55) A caravanserai in East Persia; (56) Gorge on the Askhabad-Meshed road; (57) Village of Sangun; (58) Kala-i-Tal in the Bakhtiari country; (59–61) Rock carvings at Malamir; (62 and 63) Nomads on the march, Bakhtiari country; (64) In the Bakhtiari country; (65) Deh Diz; (66) Bridge at Dopolan; (67) Looking down the gorge from the Dopolan bridge; (68) The Seistan commission camp; (69 and 70) Fort Nad-i-ali, Afghan Seistan; (71) A gymkhana in Seistan, the audience; (72) The British Consulate in Seistan; (73–75) Ruins at Sar-e-Tar, Seistan; (76) Camels crossing the Helmand; (77 and 78) Afghan cavalry; (79) Baluch chief.

Asiatic Turkey. **Maunsell.**

Thirty-two photographs of the Hejaz railway, taken by Lieut.-Colonel F. R. Maunsell, C.M.G., R.A. *Presented by Lieut.-Colonel F. R. Maunsell, C.M.G., R.A.*

These photographs are of more than ordinary importance and interest, and are a valuable addition to the Society's collection. Very little is known in this country of the line followed by the Hejaz railway, and Colonel Maunsell has taken advantage of the opportunity afforded him on his recent visit to obtain an excellent series of views which give a good idea of the places through which the line passes, and the desert nature of the scenery along the line. The photographs are extremely good and clear. They are as follows:—

(1) Street scene in Damascus, showing electric tramways and es Sabunie Mosque; (2) Street in Damascus with es Sabunie Mosque; (3) El Kadem station, Damascus, with repairing works; (4) Bawaubet Allah, Damascus, starting-place of Mecca pilgrimage; (5) Street in old Damascus; (9) Maan station; (7) Maan station, general view of western end; (8) Maan station, general view from hill to north; (9) Batn-el-Ghrul escarpment from the east; (10) Batn-el-Ghrul escarpment, south-west side; (11) Southern approach to Batn-el-Ghrul along the Wadi Rutm; (12) Watchmen's tents near Kelaat-i-Mudeverre; (13 and 16) Pilgrim route to Mecca, Kala of Zat-el-Haj; (14) Station of Kelaat-i-Mudeverre; (15) Country west of line near Kelaat-i-Maudeverre; (17) Typical view in desert, east of Zat-el-Haj; (18) Hills of Haraat-i-Ahmar from the north; (19) Country east of line near Tebuk; (20) Hills east of line near Zat-el-Haj; (21) Approach to Haraat-i-Ahmar from the south; (22) Oasis of Tebuk, Kala of Tebuk; (23) Oasis of Tebuk, Bedouin tent; (24) Oasis of Tebuk, view from south-east; (15) View of northern end of Oasis of Tebuk; (26 and 27) Oasis of Tebuk, springs near

Kala; (28) Tebuk station; (29) Oasis of Tebuk from the south; (30) Hejaz railway, travelling Mosque carriage; (31) Railway truck with passengers; (32) Deraa junction, Albanian labourers for the line.

Congo State. **David.**

Two photographs of Wambitti Pygmies of the Semliki forest, near Mbeni, taken by Dr. T. David. *Presented by Dr. G. Schweinfurth.*

Carefully arranged groups of these remarkable little people, taken by Dr. David in his journey during 1904, a short account of which appeared in the *Geographical Journal* for September, 1904.

Java and Sumatra. **Hincks.**

Fifty-four photographs of Java and Sumatra, taken by Captain T. C. Hincks in 1903. *Presented by Captain T. C. Hincks, Royal Berks. Regt.*

An excellent little series of photographs of considerable interest taken in the islands of Java and Sumatra, including volcanic craters, ancient temples, types of buildings, railways, and other interesting subjects.

Java:—(1–4) Buitenzorg gardens, near Batavia; (5) Peak of Pangorango; (6) Pangorango, with crater of Gede in foreground; (7) Native hut on side of Gede; (8) Hot stream on path up Gede; (9) Waterfall at Chibodas; (10) Street scene, Chanjur; (11) Paddy fields near Garut; (12) Paddy fields and irrigation terraces; (13) Road scene near Garut; (14) View inside crater, Papandayan volcano; (15) Sulphur pillar, Papandayan; (16 and 17) Crater of Papandayan; (18) Boiling spring, Lake Telaga Bodas; (19) Native house and compound near Garut; (20 and 21) Street scene, Suerakarta; (22) Bhuddist temple at Boro-Codoer; (23–24) Temples at Brambanan; (25) Figures at entrance to one of the temples, Brambanan; (26) The peak of Smeroe from Mungal pass; (27) Batok peak and the Sand sea from Mungal pass; (28) Batok peak from edge of Bromo crater; (29) Punduq-lembu from the Bromo; (30) The Sand sea; (31) Western wall of the Sand sea; (32) Cultivation in steep valleys near Tosari; (33) Wonokitri village, looking towards Tosari; (34) Cutting paddy near Lawang; (35) Natives harvesting paddy; (36) Paddy fields in plain near Lawang.—Sumatra:—(37) Native boats, Bawean island; (38) Coal sheds, Sabang; (39) S.S. *van Swoll* at Olehleh; (40) Olehleh from the sea; (41) Lake and village of Maninjo; (42) Lake Maninjo; (43) Gorge at Harau; (49) Gorge at Harau, looking up; (45) Native houses at Harau; (46) Street in Harau; (47) Railway station at Sungei Lassi; (48) Lake Sinkarah from Batu Jabal; (49) Paddy fields near Sinkarah village; (50) Native house and rice barn, near Padang; (51) Street scene, Paya Kombo; (52 and 53) Crater of Merapi volcano; (54) Singalang mountain from Merapi crater.

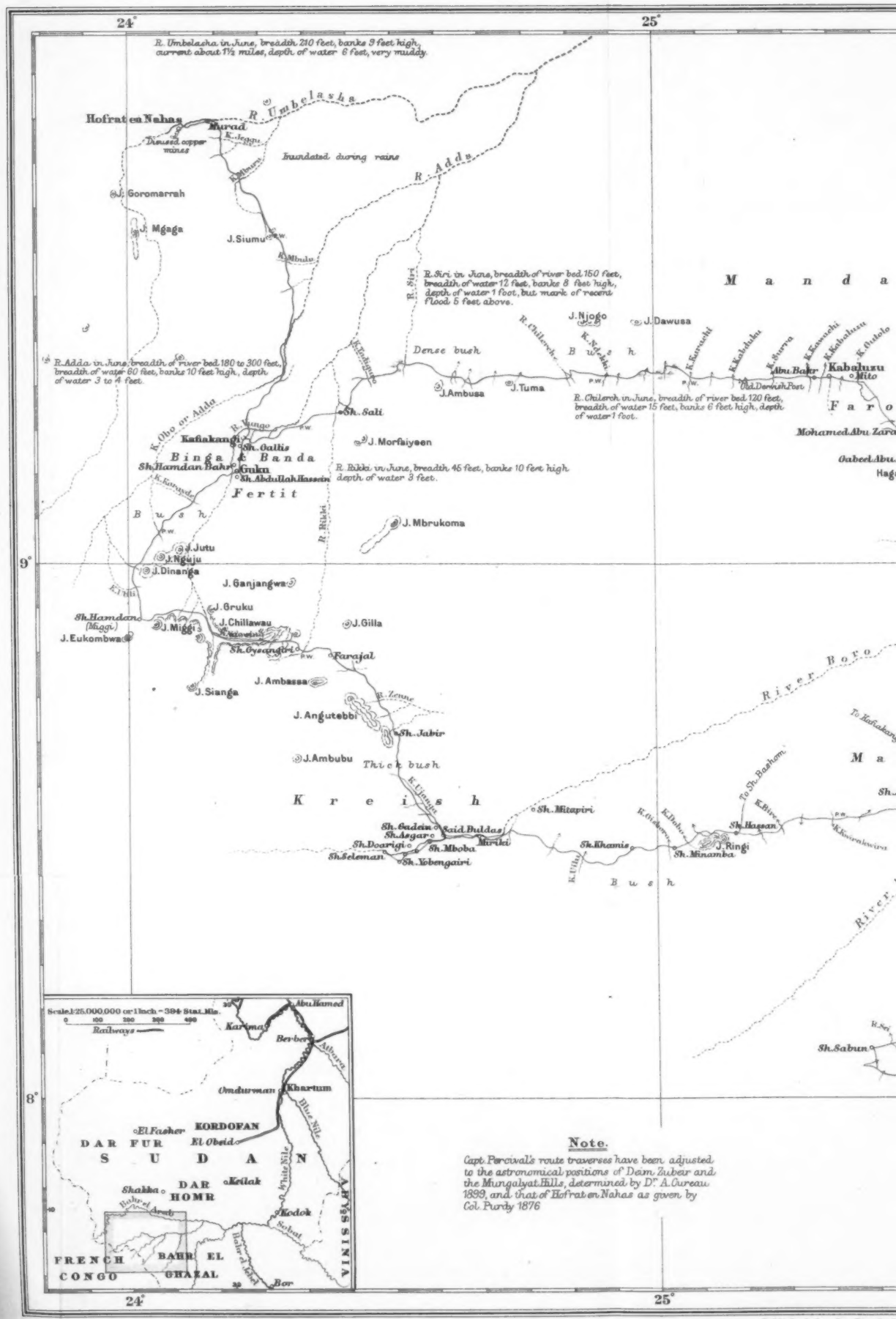
Russia and Rumania. **Wilkinson.**

Forty-eight photographs representing Jewish towns and life in Russia and Rumania, taken by the Rev. S. H. Wilkinson. *Presented by the Rev. S. H. Wilkinson.*

The Rev. Samuel H. Wilkinson, as superintendent of the Mildmay Mission to the Jews, has had opportunities for gaining an acquaintance with Jewish life in Russia and Rumania not afforded to many, and these photographs, which he has been good enough to present to the Society, are therefore of considerable importance.

Russia:—(1 and 2) Wilna; (3) Station, Wilna; (4) The gates of Great Synagogue, Wilna; (5) Courtyard of Great Synagogue, Wilna; (9) Commercial school, Wilna; (7–9) Minsk; (10) Jewish market, Minsk; (11) Fish market, Minsk; (12) The prison, Minsk; (13 and 14) Beresino; (15) Jewish sabbath, Beresino; (16 and 17) Smolowitzi; (18) Jewish children, Smolowitzi; (19) The old market, Warsaw; (20) Leszno; (21) Krakowski Predmjeste; (22) Nalewki; (23) Approach to Praga bridge, Warsaw; (24) Rumarska; (25–27) Nicolaieff; (28–30) Odessa; (31 and 32) Jewish soup-kitchen, Odessa; (33) Reservists, Odessa; (34) Kischeneff; (35 and 36) Ruins of Kalarasch after Pogrom, November 5, 1905; (37–40) Sebastopol; (41) Road travelling in Russia; (42) Intermediate railway station in Poland.—Rumania:—(43–45) Podul-Iloiae; (46) The station, Podul-Iloiae; (47 and 48) Negresht.

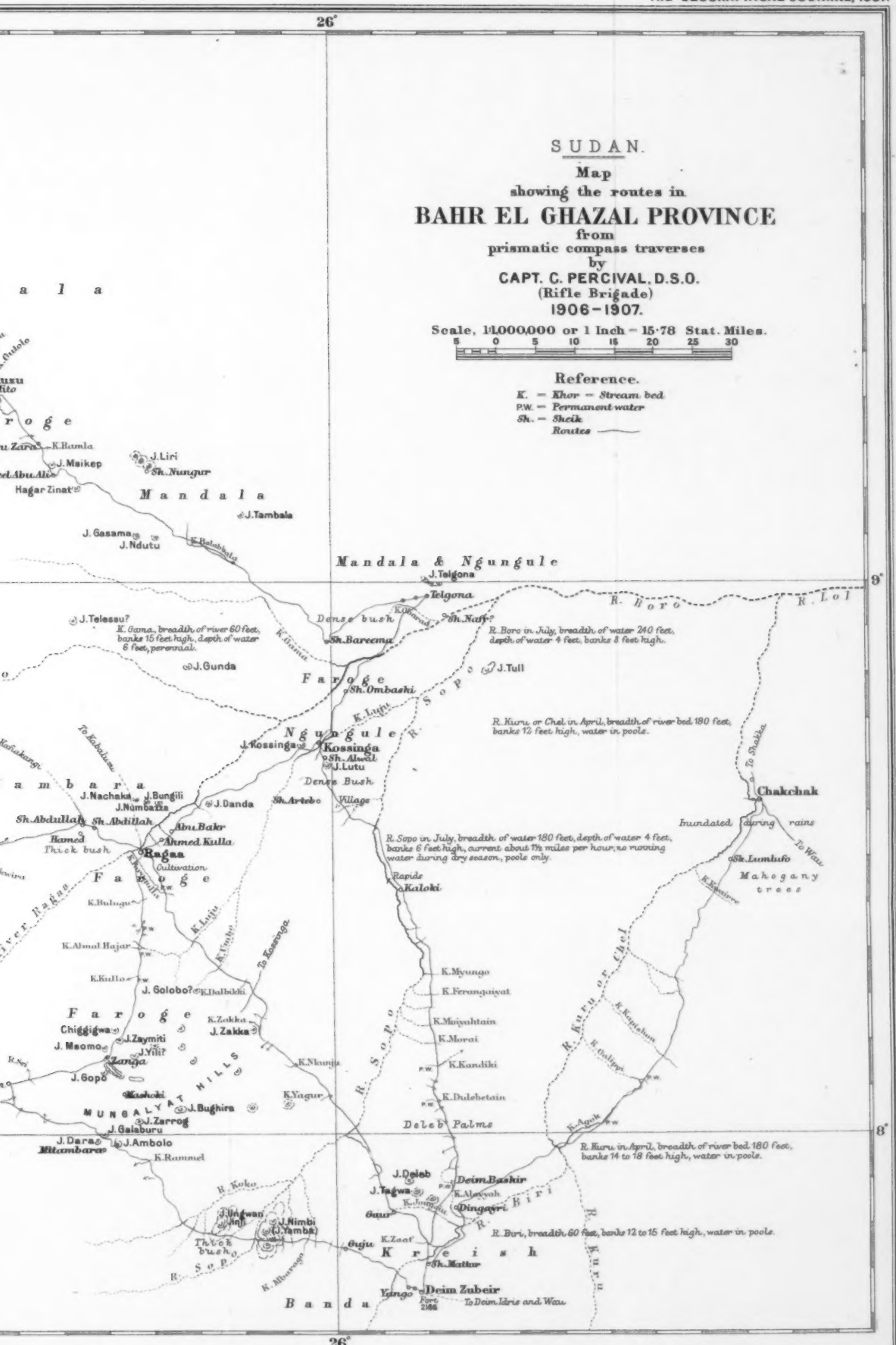
N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

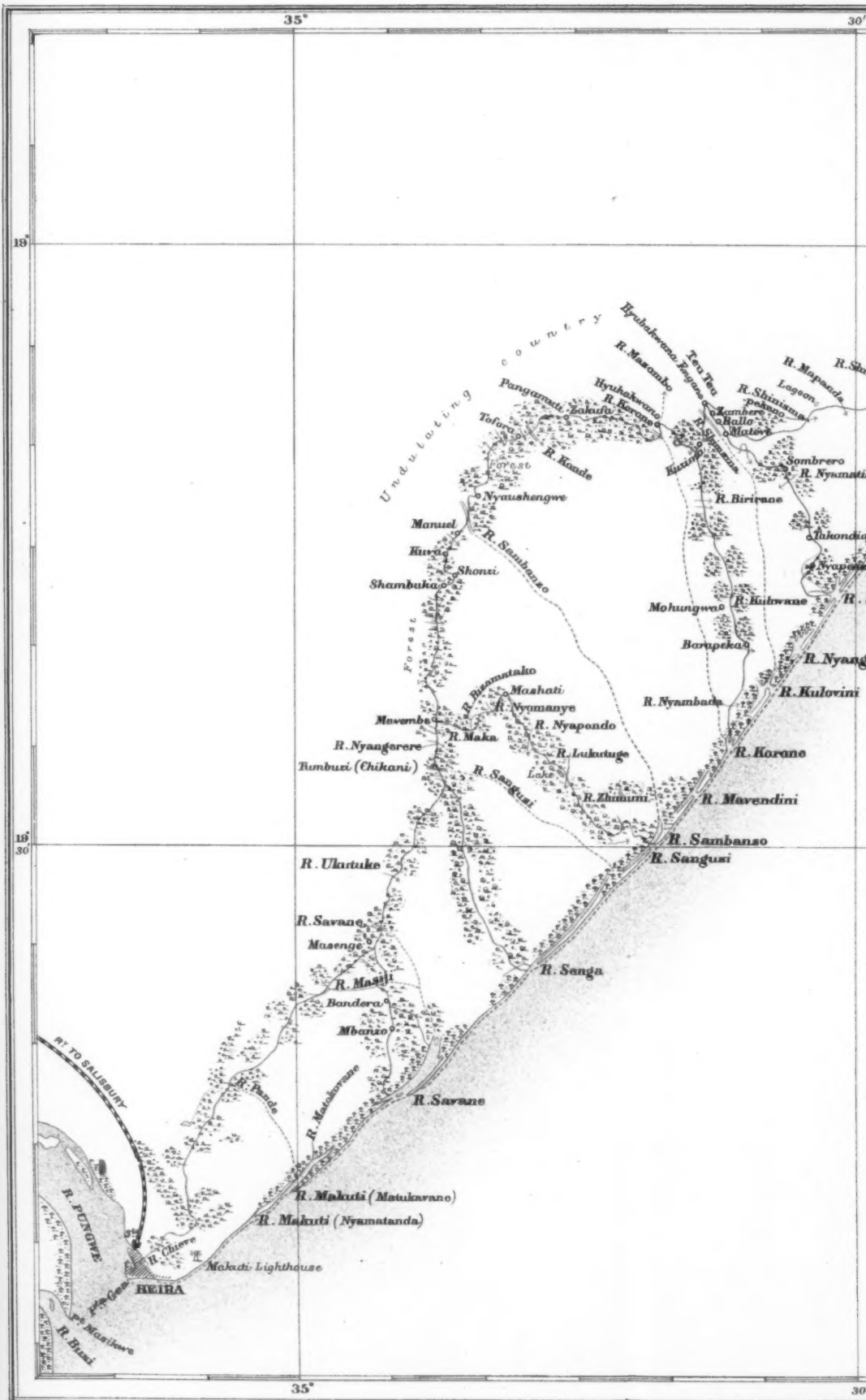


Note.

Capt. Percival's route traverses have been adjusted to the astronomical positions of Dam Zubeir and the Mungalyat Hills, determined by Dr. A. Cureau 1899, and that of Hofrat en Nahas as given by Col. Purdy 1876

Published by the Royal G


26°
SUDAN.
Map
showing the routes in
BAHR EL GHAZAL PROVINCE
from
prismatic compass traverses
by
CAPT. C. PERCIVAL, D.S.O.
(Rifle Brigade)
1906–1907.
Scale, 1:1,000,000 or 1 Inch = 15·78 Stat. Miles.
5 0 5 10 15 20 25 30
Reference.
K. = Khor = Stream bed
P.W. = Permanent water
Sh. = Sheik
Routes
Mandala & Ngungule
Mandala
Farogé
Ngungule
Kreish
Banda
Dense bush
Thick bush
Village
Cultivation
Rapids
Deleb Palms
Mahogany trees
Inundated during rains
MUNGALYAT HILLS
J. Telgona
Telgona
Sh. Nafi?
Sh. Bareema
J. Telessu?
K. Gama, breadth of river 60 feet, banks 15 feet high, depth of water 6 feet, perennial.
R. Boro in July, breadth of water 240 feet, depth of water 4 feet, banks 8 feet high.
J. Gunda
J. Tull
Sh. Ombashi
R. Kuru or Chel in April, breadth of river bed 180 feet, banks 12 feet high, water in pools.
J. Kossinga
Kossinga
Sh. Alwal
J. Lutu
J. Nachaka
J. Bungili
J. Nimbazza
J. Danda
Sh. Artebo
Sh. Abdullah
Abu Bakr
Ahmed Kulla
Ragaa
Chakchak
R. Sopo in July, breadth of water 180 feet, depth of water 4 feet, banks 6 feet high, current about 1½ miles per hour, no running water during dry season, pools only.
Sh. Lumlufo
Kaloki
K. Myungo
K. Ferangaiyat
K. Meiyahtain
K. Morai
K. Kandiki
K. Dulebetain
J. Golobo?
K. Dalbakki
K. Zakka
J. Zakka
Chiggigwa
J. Zaymiti
J. Msomo
J. Vili?
Zanga
J. Gopo
Kashaki
J. Bughira
J. Zarrog
J. Gaisaburu
J. Dara
Mitambara
J. Ambolo
K. Rummel
K. Nkunja
K. Yagur
J. Deleb
Deim Bashir
J. Tagwa
K. Mayyah
Dingaiyi
Gaur
J. Unguan Anji
J. Nimbi (J. Yamba)
Guju
K. Zaat
Sh. Mathur
Yango
Deim Zubeir
Port 2166
To Deim Idris and Wau
To Kabakwa
To Shakka
To Wau
To Kossinga
R. Boro
R. Lol
R. Sopo
R. Kuru or Chel
R. Biri
R. Kuru
R. Koke
R. Mbarango
K. Lugu
K. Umbe
K. Ahmal Hajar
K. Kullo
K. Bulugu
K. Kapalum
K. Dalipp
K. Agok
K. Kamirre
K. Rama
K. Lugu
K. Kapilli
K. Kuru
K. Jangulu
K. Zaat
K. Mbarango
J. Lutu
J. Kossinga
J. Bungili
J. Nachaka
J. Nimbazza
J. Danda
J. Gunda
J. Telessu?
J. Telgona
J. Liri
J. Msikep
J. Tambala
J. Gasama
J. Ndutu
K. Ramla
Hagar Zinat
Sh. Nungur
Sh. Abdullah
Sh. Abdillah
Hamed
Thick bush
Abu Bakr
Ahmed Kulla
Ragaa
Cultivation
Chiggigwa
J. Zaymiti
J. Msomo
J. Vili?
Zanga
J. Gopo
Kashaki
J. Bughira
J. Zarrog
J. Gaisaburu
J. Dara
Mitambara
J. Ambolo
K. Rummel
J. Golobo?
K. Dalbakki
K. Zakka
J. Zakka



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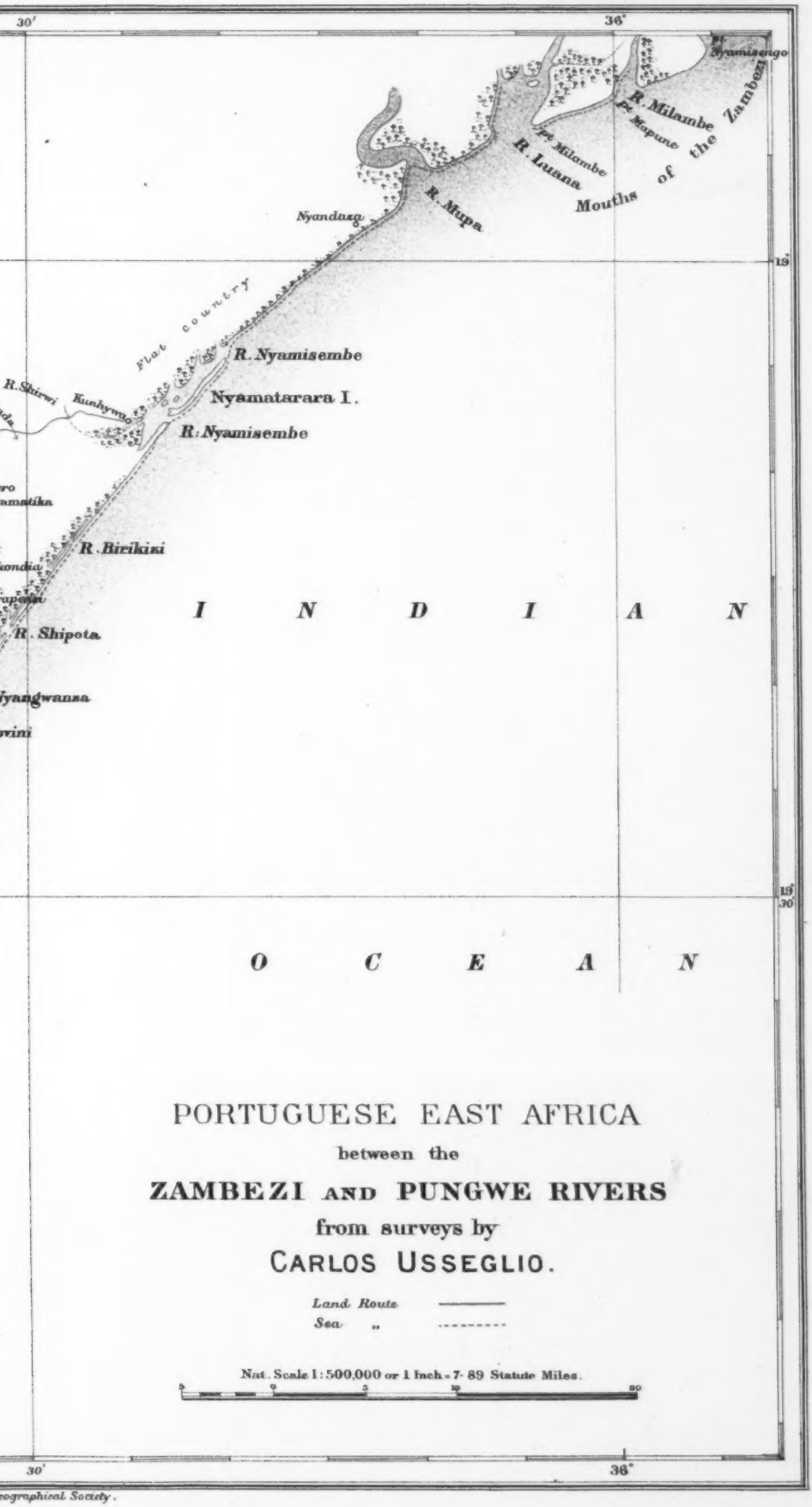

PORTUGUESE EAST AFRICA

between the

ZAMBEZI AND PUNGWE RIVERS

from surveys by

CARLOS USSEGLIO.

Land Route ———

Sea " ·····

Nat. Scale 1:500,000 or 1 Inch = 7·89 Statute Miles.

0 5 10 20

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